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The WHITE Heavy Duty Truck

with DOUBLE REDUCTION Gear Drive

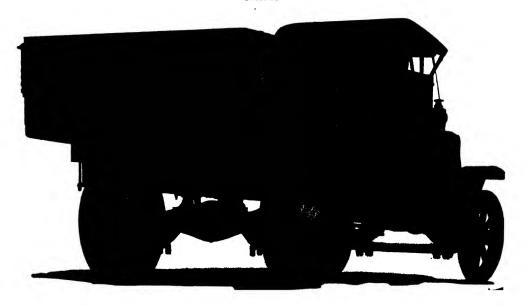
Having all the leverage and flexibility of a chain and sprocket and the frictionless driving contact of gears which *roll* in oil, dust proof

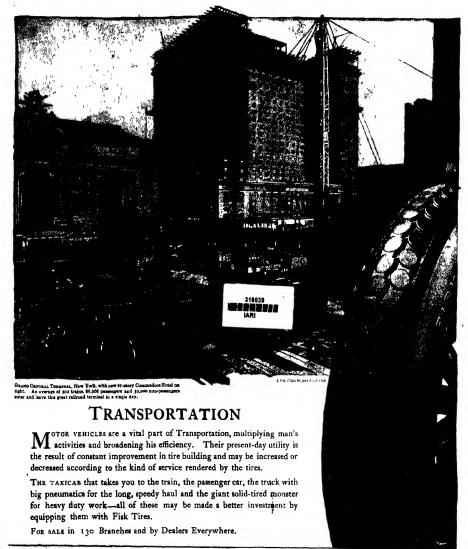
Light Unsprung Weight - More Road Clearance Narrow Tread - High Leverage



THE WHITE COMPANY

Claveland









Now that we have Peace, what are we going to do with it?

To the Manufacturer:

After the joys and celebrations of peace are forgotten, there remains the stern and difficult task of restoring your factory to a peace basis. Whether the factory has been making hand grenades or pianos, the war has imposed certain restrictions which alter former conditions; and with the advent of peace, new conditions are met. In some cases increased facilities, due to munition work, call for new products to take the place of the abandoned military ones. In others, the old-time products of former peace days, have been worn threadbare, and new ones are necessary. What are you going to make?

To the Inventor:

Your opportunity is at hand. You are being sought today for your ideas. Those patents which were granted you several years ago, and which have lain dormant in the pigeon holes of your desk or in the strong box at home, may now find a ready market if they have reasonable merit. For the increased manufacturing facilities of many American industries, brought about by inflated military production, are now seeking for something to make—something which can keep the wheels turning. The ammunition of today is ideas; and the batteries of lathes, planers, automatic machinery and so on are standing by waiting for you.

TO the end of bringing the manufacturer in touch with the inventor, so that one may obtain the ideas which the other desires to dispose of, the SCIENTIFIC AMERICAN has established a Reconstruction Department. Under that heading will be published the requests of manufacturers for new ideas, stating their facilities and specific requirements, as well as the offerings of practical inventors. The department is to be a rialto for manufacturers and inventors. It is but another feature which goes to make the SCIENTIFIC AMERICAN "The Journal of Practical Information—and Practical Service."

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The Coos County Forests

IN Coor County, Oregon, on the western ade of the Coast Range Mountains, through a primitive forest of fir and cedar the Lost River wends its way. In one of the most inaccessible parts which only the hardiest of "hikers" have penetrated the

"hikers" have penetrated the triver makes a drop of nearly 100 feet. The overhanging bank forms a deep case before which the water forms a gausy curtain. The diministrice spectators in the accompanying photographs give some idea of the height of the falls, and the aise of the height of the falls, and the aise of the height are viewed Lost River Falls have seen nature just as the maker designed it. As yet its suntouched by man

Lost River empites into the East Fork of the Coquille River This river also forms a cascade of rare beauty, the Cape Horn Falls Here grows the myrite tree, a very hardy tree, but one that cannot he transplanted It furnishes a lard beautifully grained, high-priced wood, used in making nut bowls The myrite tree, although plentiful on the west sude of the Coast Range is not to be found on the east side

A still lofter cascade is to be found in the Camas Creek, where there is a drop of 200 feet "Toe Head Falls," as it is called, is located in the recesses of an almost unknown for it. The photograph shows two timber crusers on the instirul foot log in the foreground. The foot log is formed by a fallen tree which holds in check a mass of flotting debris. In this

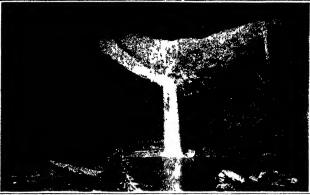
region beautiful forn fronds are to be found as tall as a man and taller

Despite the hardships of penetrating the primitive forests of Coos County, visitors will be amply repaid for their arduous efforts in the magnificent examples of

the inagnificent examples of Nature's handiwork which abound in these wild regions

Mt. Katmai Explorations

THE exploration of the Mt Katmai region, in Alaska, under the auspices of the National Geographic Society, which is likely to be of several years' duration, was carried forward last summer by Messrs J Sayre and P P Hagelbarger After a hazardous voyage, they arrived on June 10th at Naknek Lake, and they completed their season's work in August The topographic survey, begun in 1917, was extended to the shores of Bering Sea, adding about 1,500 square miles to the map and completing a sec-tion across the base of the Alaska Peninsula from Katmai Bay to Kaknek Lake Measurements of the temperature of volcanic vents were made with pyrometers supplied by the Carnegie Geophysical Laboratory, the highest temperature found being 430 deg ('ent



Photographs all by Math Parce

Lost Palis as viewed from the natural cave below



Where the Last River makes a drop of nearly a



The feathery falls of Lost River. Note the figures on the log below the falls



Toe Head Falls, 200 feet high, in the recesses of an almost unknown forest

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The abject of this poured is to record accurately and liveally the latest scientific, mechanical and industrial nears of the day. As a weekly journal, it is in a position to announce interesting direlepments before they are published class here.

The Latter is glad to have submitted to him timely articles suitable for these columns especially when such articles we accompanied by photographs

Harmony of the Peace Conference Threatened

E showed last week, that the end of the war finds the United States Navy in second position and equal in power to the three next navies combined. This very startling revelation must be borne in fund when considering any plans for future naval expansion.

During the ten years preceding the outbreak of the European war, Congress had been conservative to the point of parsimony in its annual appropriations for the unkeen and increase of the Navy The dangers of this policy were repeatedly pointed out in these columns, and when the war began, the SCIENTIFIC AMERICAN did what it could to explain the situation and make clear the absolute necessity of bringing the standing of our Navy back to second place. It is quite possible that neither Congress nor our people had appreciated the menace involved in Germany s naval program, which mereased with the passing years, even if the German plan of world conquest had been revealed in those days, no one would have believed that it was anything more than an empty dream But whatever lay back of German naval activity the fact that our fleet was falling so far behind the German fleet in fighting strength, filled all careful students of the naval situation with deep concern

In 1916 a vast program of now construction was mapped out and passed by Cougross, and although the ships of that program have not been built, owng to other and more imperative naval work demanded by the exigencies of the war it was an excellent provision and it would have brought us back to the second place. It still remains on our books as as authorized program to be extreded.

But the astounding proposition is now made by the Secretary of the Navy, not only that this program should be completed, but that an additional program, equal in extent, should be approved by Congress Those who are interested in naval affairs are confounded by such proposals being put forward at this time, and naturally sak the meaning of any such amazing increase of our navy

The explanation put forth by Secretary Daniels and Admiral Badger, that we need 32 new super-dreadnoughts to police the sens in time of peace, is so puerile that it is difficult to take it seriously Policing is done by gunboats and labt crusters, not by super-freadnoughts

Moreover, it is evident that the announcement of such an nonrmous program places the United States in a most inconsistent, if not ridiculous position. Our President has gone before the Allient and incoming the proposal for a Leegue of Nationa in the other, and words of peace upon his lips, nevertheless, while our President is thus advocating disarrament and the destruction of militarism, the Secretary of the Navy is calling for an enormous increase in the size of our navy with all the threat of militarism which that implies. The Secretary is in earnest, for he has made speeches advocating this plan on various occasions and in different parts of the country Meanwhile our Press is discussing the desarability of taking the magnificent German fleet which has been surrendered to the Allies, and sinking it on the high sees, as the samplest method of

disposing of what might become a cause of dissension among the Allies; atthough this assumption of existing jealously among the Allies is gratuitous, unwarranted, and in devidedly bad taste

We heatare to believe that Mr Daniels, who has always been an advocate of peace, has suddenly become a disciple of militarism; but can any other construction be placed on he action? The Secretary of the Navy is no doubt a good Democrat He as member of the Cabinet of the Democratic administration which for overhalf a century has advocated economy in governmental administration. Is Mr Daniels true to these principles when he brings forward, at this time, a naval program which will add many billions to the public debt?

This proposed fleet must be paid for by the people, and the Secretary calls upon every American estiment to meet has share of an expenditure which is as Vast as it is needless. It would seem that the heavy sums which have been handled in the course of the war have so blunted the many sense of some of our Government officials, that they have forpotten that it is the industrial tarpayers of the United States who must carry the burden and pay the price

Our President has very definitely announced that the advantages which the United States expects to gain from this war are of a purely moral and spiritual kind. Not the least of these is the sweeping away, once for all, of that long-discredited "whip-resiston" spirit, which Mr Daniels (unconsciously, of course) is fanning into flame by his advocacy of the biggest away one aerth.

The Factory and the Home

BUCYRUS, Ohio, manufacturer recently brought to that city, by a great effort, 150 employees, after a few days 30 remained, the blainec having decamped because they could find no comfortable homes A prominent public sorrier corporation near Philadelphia confesses to a labor turnover of 1,100 per cont, and while this is exceptional, a figure of 400 per cent is common

These conditions are widespread During the past two or three years employers of labor in all our big industrial centers have experienced such difficulty in getting and keeping men that much attention has been focused upon the employment situation. Investigation has shown that one of the prime causes for the shifting population and large turnover of many plants is the utterly inadequate housing accommodations available for the workers.

In years gone by, when wages were low and "labor turnover" meant nothing to the accountant of costs, there was always a long line of men waiting for a job; and because of this excess of supply over demand, a man was not so ready to throw up his job and look for another. If would put up with poor housing conditions for the sake of having any job at all. But tooks of the sake of having any job at all. But tooks there is no longer the economic pressure upon the worker that forces him to sleep six or eight in a room hardly big enough for two, and to turn out of bed in the morning just in time for the night-shift man to take his place. So as fast as manufacturers bid for his services by putting up decent houses, he is going to leave the old unsanitary crowded quarters and go to the new village where he can hiv decently with his wife and family.

The manufacturer will do well to bring himself to a realisation of the fact that labor, in thus exacting decent living accommodations, is not holding up the community or the employer for something that is not its just due. The laborer is rather in the position of one who has been unable to get what was due him, and who now for the first time is free of that disability. Naturally enough he makes hay while the sun shines, here as well as in the matter of wages, but while wages may go back to a lower level, it is not conceivable that it will ever again be good form to herd workers in the disgraceful manner in which they have been herded in the past

Indeed, apart from any consideration of this subject on the humanitarian or sentimental side, the industrial employer is beginning to realise the tromendous importance of good living conditions in their relation to production. Many years ago he discovered that it paid to give his workers decent surroundings while at their work, and now be a discovering with equal force that it pays to see that they have a place to live in which a normal human being can take some pleasure in living.

The manufacturer is finding out that men who are housed in unhygienic and unsanitary dwellings are not so healthy, not so efficient, lose more time through sickness, and are more stupid and more troublesome in this plant. Statistics compiled in Chicage and electrics show conclusively that the areas having maximum density of population coincide with those having the highest percentage of tuberculcois and other contagious diseases, as well as of crime and social evil. Indeed, it could not be otherwise.

The output of a plant is satiously affected by the prevalence of sickness. With open privise and cesspoole in every workman's backyard, and wells within 20 fact of these, typhoid is an ever present alonger. With overcrowding and lack of opportunity for personal cleanliness, tuberculosis and other diseases flourish. We know one estimable lady who supports hereelf is a manufacturing town by taking in lodgers, and who accounts herealf fortunate when, as is frequently the case, she secures a roomer who declares that he does not wish to use the bath tub. Her mistaken point of view is well matched with that held by many@mployers, but, happily, every day by less. We are affect coming to realise that people who hve in pig-stikes are likely to be and to act hist pigs. If we want respectable and in telligent men and women to work for us, we must see that they have deecent, healthy and comfortable homes.

It is for this reason that, more and more, employers are sesuming responsibility of some sort in connection with housing accommodations for their workers. This need not always take the form of company-owned cottages or apartments-s form that is often resented, even when coupled with a scheme for ultimate sale to the tenant. It has many weak points to offset its obviously strong ones, and makes the maximum demand for extreme judgment in administration; but in many instances it is the only satisfactory solution. Indeed, in the twentieth century reaction from the nineteenth century idea that every man's life was his own-as run and run as he pleased so long as he steered clear of actual crime, we are developing a race of people who deal so expertly in human relations that, after all, the dangers of paternalism and the probabilities of any system degenerating into peonage are minumised.

Without hesitation, we say that every large plant located outside the very biggest centers of population should choose between three alternatives. One of these is regulating housing conditions from without, by bringing pressure to hear upon owners and local authorities. The second is similar regulation brought about by actual participation in the business of housing. The third is submission to a high turnover and a low class of workers. For today, unless an employer sees to it that his employees have a respectable place to live in, he cannot get good mean or keep any kind of man

And finally, if the employer does not set his house in order of his own accord, it is up to us to make him do so; for our reconstruction program can be hampered by no factories that are running at half or quarter their rated capacity through ineffective labor conditions. Great Britain has spent \$700,000,000 on industrial housing since the war began; with our late estrance we have spent \$110,000,000, which is but a tithe of the capital that must oventually go into the improvement of our workers' home.

Fossils from the Canadian Rockies

LATE report on the explorations and field-work of the A LATE report on the saputation in 1917 records a remarkable collection of fossils made by Secretary and Mrs. Walcott at the now well-known "Burgess Pass fossil quarry," near Field, British Columbia, discovered in 1919. Ir the course of 50 days' work the party took out a section of the quarry about 180 feet square, thus practically exhausting a site that has yielded the finest and largest series of Middle Cambrian fossils yet dissovered, and the finest invertebrate fossils yet found in any formation More than a ton and a half of specimens were trimmed out at the quarry, wrapped in bundles, carried by pask horses to camp and thence to the railway stati Field, whence they were shipped to Washington. Large blocks of hard shale were first blasted loose, then carefully split with chisel and hammer to expose any fossil remains between the lamins. The shale has preserved for some twenty million years animals that were as soft and non-resistant as jellylish, worms, crass, etc., not-withstanding all the vicinstudes these rooks have since undergone from the time they were simply hardene mud. They have been subjected to much pressure and profound chemical change, but the fossile remain vierte

Review of the Year 1918 The World War

FifE closing months of the year now past witnessed the fall of the curtain upon the most stupendous of all the multiplied human tragedies which have moved across the stage of life since life began.

War, at any time, even when its wounds and sorrows are tempered by forbearance and chivalry, is a dreaded thing, the threat of which, when it lifes its head over the worge of the world, makes the cheek blanch and the routest heart quail. This is true, even when nations which are enriched with the gifts and graces of civilisation fight for causes which seem to each contestant to invalve the fundamentals of right and morality.

The horror and enormity of this war lie in the fact that it was an avowed strack upon Civilination itself that the assault was carried on with a cynical and calculated disregard of every consideration of chivalry and meroy—and that, if it had won out, all the world's cherished and hardly won ideals of Justice, Freedom and Honor would have been thrown down, and the God of Brute Force would have been set up in their place.

The cost to Germany and her allies of this monatrous raid upon the world was 3,350,000 dead and 12,070,000 casualties. The assault was met and mastored by the forces of Civiliation at a cost of 4,560,000 dead and 19,525,000 casualties. The casualties on all sides reached a total, therefore, of 31,595,000.

Increasingly, as the years roll by, the historians of the future will write it down that this stupendous conflict was fought out to make the world a safe place, not merely for Democracy, but for Civilisation itself.

Nevel

In any review of naval events during the past year, the outstanding fact is the crowning demonstration of the decisive value of the command of the sea. Mahan explained all that to us years ago. What a pity it is that he did not survive to witness the latest demonstration of the truth of the principles he laid down in his great work "Seapower in History," and take his stand with Admirals Beatty, Sims, and Rodman on the bridge of the "New York", to survey the surreader of the German fleet. Wars can be won by blockade as well as by battle. It was blockade that brought Germany to her knees, and, as a substitute for battles, it is an altogether merciful and humane provision for bringing an enemy to terms. Also, it is an effective means, in time of war, of making sure that the freedom of the seas shall be unobstructed in times of peace

Although the war is over, not much information is yet available as to the warships and new material which have been developed abroad. Capital ships continue to increase in size, speed, and gun-power. The British have built some battle-cruisers of about thirty-two thousand tons displacement, 33 knots speed, carrying the 15-inch gun in their main batteries, and with moderate armor protection. Also, they have brought out an entirely new type of ship in the "Furnous"; a sort of magnified destroyer, as long as the largest Atlantic liners, narrow, of shoal draft and heavily engined. The reputed speed is 40 knots and the reputed armament, as originally placed, was two 15-inch guns. Another novel type is the monitors, of which, we understand, some thirty have been built. They carry a pair of heavy 19- to 15-inch guns, in a single turret. The speed is very low indeed, and they were built mainly to attack the German bases on the Belgian coast. They are practically useless today. The British appear to be satisfied with the 15-inch gun for the main armament of their battleships; the United States will use the 50 calibre 16 inch gun in all future dreadnoughts, whether ther be battleships or battle-cruisers. The first four battleskips of the 1916 program and the six battlecruisers will mount this fine piece, which fires a 2,200-pound shell with a velocity of 2,800 feet per second.

The war hat served as a fresh demonstration of the efficiency of the United States Navy. It found the navy, as usual, "on its teen." The best of our destroyers were at space dispatched to the submarine some; 150 new destroyers, seems offered; guas were found for arraing dur miniphant ships, and shifted gun crows were sent-te man; 150mm; 150m, 150

of new and powerful scaplance was designed and put under construction; scaplance bases were established on the British and French coasts, and the personnel of the navy for manning our warships, transports and merchant ships was raised to 700,000 men. The close of the war finds our navy the second most powerful in the world, and equal in strength to that of the next three of the great naval powers combined

Military

Unquestionably, the most novel and most effective of the new weapons of warfare developed during the great conflict, was the tank. Its first operations in 1916, in the great British attack on the Somme, were necessarily tentative in character As the war progressed tank tactics developed in efficiency, and in the 1917 attack at Cambrai, it came into its own by making a 10-mile breach through the German system of ontrenchments-this being the first time that an absolute break-through was accomplished. The campaign of 1918 served to introduce the winppet or small "baby" tanks, and in the great counter-offensive operations of this year, both of the French and Bruish and Americans. the tank established itself as the most effective weapon of the offense; in fact, German inditary commanders openly attributed the success of the Albed offensives to the employment of the tank in large numbers

The war has demonstrated the enermous nulitary value of the machine-gun, especially as a weapon of defense But for two American inventions, the machinegun and the submarine, the German armies would have collapsed long before they did, and it is a fact, that by far the major part of the casualties of the war on land have been due to the heavy and light machine-guns As regards artillery, the most remarkable development has been the use of guns of the very heaviest caliber in mobile field operations. Before the war, the six-inch howitzer was considered to be the heaviest piece that could be used in the field. Austria and Germany surprised the world with their 12-inch and 16-inch semimobile howitzers, and at the oud of the war the heaviest and most powerful guns in existence, including the 21-inch gun of the French, were in the field and following up the retreat of the German armies Notable work in this direction was done by our army and navy, the navy having placed in the field several batteries of 14-inch naval guns mounted on specially-designed railway carriages, and also a certain number of our 16-inch guns. These were used to good effect in shelling important military roads and railway lines in the back areas of the enemy.

Field and heavy artillery cannot be built over night, but the Ordnance Department of the army had begun the construction of a vast amount of ordnance, in which was incorporated the ripe experience of our Allies during four years of war, and which included such improvements as had suggested themselves to our own expert artillerists. Had the war been extended into 1919, the Germans would have been subjected to an overwhelming weight of artillery fire from guns of our own design and manufacture.

A weapon which excited widespread interest at the time was the 75-mile gun, with which the Germans shelled Paris. There is nothing novel in the principles employed in the design of this gun Whatever may prove to be the details of its construction, it will be found to embody an unusually large powder chamber and an exceedingly long bore; the one to provide sufficient powder for a range of such great length, and the other to provide sufficient space or volume in which to de velop the expansive energy of the gas If any nation wished to do so, it would be perfectly feasible to build; gun with a range of 100 miles or over So far as we know, the Allies have not, as yet, come into possession of any of these guns, and the particulars are not yet available. It is certain, however, that the Germans either built an entirely new piece of 75 to 100 calibers length, or sub-calibered a standard 15- or 16-inch gun by inserting a liner.

Engineering

During a war which was essentially a war of machinery, it was inevitable that projects of peace-time engineering would suffer. The accomplishments of the engineer have been more in the like of thoughtful investigation and planning than of actual construction. The New York State Barge Canal is supposed to have been finished, but this great work has been so completely the football

of conscienceless politicians that it is difficult for the taxpayer to find out either just where his money has gone or what he has got for it. God send the day when public utilities will be taken entirely out of the hand of the politician and committed to the unbindered control of reputable and qualified non-political engineers than whom no wiser, more honorable and more able class of men is to be found in the country. Hydraulic and reclamation work is very much in the air just now, the government talks of vast schemes of reclamation, and of the placing of our returned soldiers on the virgin and fruitful soil Canada, with characteristic energy, has started upon a great enterprise for the development of 300.000 hydro-electric horse-power from the Ningara River, and she proposes to secure an effective head of 305 feet (instead of about one-half of that as in the case of power plants located at the Falls), by building her power plant at Queenston, below the rapids, where the river level is only two feet higher than the level of Jake Ontario

According to Dr. Waddell, the well-known consulting engineer, there is under serious consideration the construction of a combined ship, samitation, and power canal from Lake Eric to Lake Ontario. The total length would be 40 miles and the depth 30 feet. The total fall is 327 feet. The object would be to transfer the largest lake vessels and barges from Eric to Ontario, to divert the sewage of Lackawania, Buffalo, Tomawanda and other enters from Eric and the Niagara River, purify it and discharge the waters into Lake Ontario, and finally, to develop about 800,000 hydroelectric horse-power. The rassing and lowering of ships would be done by buge lift-locks capable of landling 650-foot ships through a vertical haight of 200 feet.

The Quebec bruke was tested out in August of last year by running out two heavily ladon freight trains, one on each track upon the central 1,800-foot span. The total load was 7,000 tons. The bruke stood the test successfully. In the field of transportation, the most notable piece of railroad construction was the completion last year of the 'desert' railroad, which forms the closing link in Australia a first trans-continental line. It took five years, working under a according beat, in a country davoid of water and vegetation, to close this 1,000-mile gap. It is now possible to make a continuous railroad journey from Perth, Western Australia, to Brabane, Ouendand, a distance of 3,905 miles.

Electricity

Although electricity is a peaceful force rather than a military one, it has thrived and forged ahead during the past year of war

The scarcity of coal in certain countries has given a trumendous impetus to bydro-electric developments, so that in Norway, for instance, hydro-electric power is now being employed to an unprecedented extent. And the generation of this cheap form of electric power has brought about the extensive application of electric current in industrial pursuits, particularly in the metallulgical field. Much has been done in establishing large aluminum producing plants and electric steel works. As a result of this inexpensive and abundant electric energy, the electro-chemical industries have benefitted in no small way.

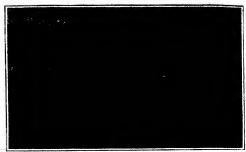
To the electric welding art, the past twelve months have contributed much. All kinds of applications have been found for this method of joining metals together interesting researches have been carried out with regard to the electric welding of ships, instead of the usual riveting process. As yet the electric welding of ships is still in the experimental stage, although it is acknowledged to have certain important advantages over the existing method, particularly in the matter of labor.

In the held of radio communication, the progress during the past year has been considerable. The radio telephone has been developed to a point of relative periotion, due to the use of the vacuum bulb generators in place of the former troublesome and uncertain are generators. With the lifting of the veil of censorship, we learned of the wireless telephone for communicating between airplanes and ground stations, making possible the greatest precision in air fleet maneuvers. Indeed, at the recent avation meet at Belmont Park, N. Y., the speciators were thrilled by the unison of movement of an entire feet of airplanes; and it was several weeks.

(Continued on page 9)



A pile of salvage at Ration Dump H of the 77th Division, and some men from Salvage Unit 18, Q. M. C., who handle salvage in this locality



German machine-gun ammunition carrier and a collection of French machine-gun parts from a dump of Salvage Squad No. 1, Q. M. C.

Where Nothing Goes to Waste

Glimpses of the United States Army's Salvage Photographs Copyright, Committee on Public Information

A SALVAGE plant for the recovery and proper use of waste material has been organized on a large scale by the Army near one of the large towns of France No army in the world has anything like it, and not a day names that representatives from some of the Allied

operation It has saved, not thousands, but milhous of dollars for our Government. We will mention the various kinds of work which are carried on in some of the departments of this vast salvage plant

For instance, the shoe department is one of the most important, and shoes and boots are brought in by thousands of pairs. They are first washed and disinfected, sorted, and then given out to be repaired, inspected and packed for shipment again The production in this branch is about 3,500 pairs per day The total value of the ontput for one month was \$149,599 About 80 per cent of all shoes received are repaired New machinery is being constantly added to this department, and when it is completely organized, it is expected that 7,000 pairs of shoes will be turned out daily. At the time of writing this branch employed two officers, seven non-commissioned officers, 114 enlisted men, 280 male and 249 female civilians

The depot has seven operating departments, hundry, clothing, shoes, rubber goods, harness and leather equipment, canvas and webbing, and metals The laundry alone employs 206 workers, over half of whom are civilians. All sorts of new devices in machinery are used, save hand labor for washing, rinsing and drying, and more than 75,000 pieces

are turned out per day. The clothing is probably the are innea out per day. The clothing is probably the most important department. Its production is limited almost entirely to breeches and blouses, underwear, bed sacks and blankets. The daily output is 10,000 woulden breeches or blouses, 25,000 of underwear or bed sacks and 500 blankets After coming from the laundry Governments do not inspect it and take notes on its

Working old hats over into new hats and bedroom slippers

the garments are examined and marked for repair, or if not reparable they are cut up for patches. The patches necessary for the reparable garments are cut entirely from the irreparable ones (15 per cent of the total), and then sent out to the various branches for the actual sewing, after which they are classified either for reissue to the troops in active service or for depot troops or labor battroops in active service or for depot troops or labor ost-talions. About 1,600 women are employed in this branch, and 75 men. The value of the production for a month was \$2,040,831, while the operating costs came to the relatively insignificant total of \$83,432.

Not a scrap of anything is wasted. Hospital slippers are made from old campaign hats that have been dis-carded The question has often been asked as to what became of these hats. fact they are of an excellent quality of felt, and no matter how old and worn they are, the felt is utilized in the soles of the slippers. The uppers are made from old woollen garments thrown aside as quite irreparable Overseas caps are another specialty made from old uniforms unfit for repair, and brassards are manufactured by the thousands for the various army services. Old garments are dyed green and marked "P W." to be used by the German prisoners of war. The old trench shoes that have already been mended and are now beyond repair, are cut up into shoestrings No matter how worn the shoes are, there is always a piece of leather left in the uppers large enough to make several pairs of strings.

The rubber goods branch also shows remarkable figures for saving. It handles primarily rubber boots and arctics, "slickers," pouchos and shelter halves, it produces about 3,000 garments and 850 pairs of boots per day. The great feature of the de-partment is the new vulcanizing machine recently put into

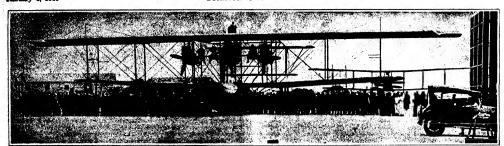
(Constnued on page 18)



Washers and extractors at work cleaning discarded United States Army clothing



French cobbiers at work in an American Army Salvage Depot



Our Navy's largest aircraft-the N. C. 1 employed for coast guard work, which recently made a flight with fifty passengers

Our Giant Aircraft

Where We Stand in the Matter of Transatlantic Flight

THINGS move swiftly in the flying world. It seems but yesterday that we were awed at the size and power of the "America"—the flying boat built by Glenn H. Curtiss for Rodman Wanamaker, who was backing Lieut. John Cyril Porte, R.N., in his attempt to win the \$50,000 prise offered by the London Daily Mail for the first transatlastic flight. Today there are

hundreds of airplanes as large or larger than the" America" in fact, flying boats of that general type have been in quantity production for some time past at our Naval Aircraft Factory. So the marvel of yesterday has become the commonplace of the present; which is another way of saying that this is the day of giant aircraft.

Prior to the great war, the efforts of all aeronautic constructors, with the exception Russian engi Sikorsky, were confined to relatively small planes. From military point of view. there was no need for huge airplanes; and, indeed, the smaller the type the more it appeared to be suited to war's requirements. During the war, however, the bel-

ligerents soon came to appreciate the military value of aerial bombing, and soon set to work on fleets of bombing planes. Germany, in order to bomb English towns, constructed her Gothas and Friedrichshafens after the failure of her Zeppelins; Italy constructed her Caproni biplanes and triplanes for bombing Austrian military centers on the other side of the Alps and far in enemy

territory; Great Britain con-structed her Handley-Pages for the purpose of repaying the Germans in their own coin. France, on the other hand, did not take to longdistance bombardment, probably because of her geo-graphical location which ade her an easy target for German bombing fleets. bomb the Germans, according to the French viewpoint, only served to provoke their only served to provoke their bombing fleets to greater efforts. Finally, the United States set to work building huge planes of the Handley-Page and Caprent types for tong-distance bombing. Another-feature of the war

which gave impetus to the big plans movement was the submarine warfare. When of aircraft in auti-operations became t, the Allied savies set to work developing scaplanes and flying boats capable of making long flights and carrying suitable armament, including depth bombs. Then it was that Great Britain went back to the "America" type of flying boat, and started with that huge type as a foundation. Today the British and American navies foundation. Today the British and American navies have large fleets of flying boats of the same general

category of the largest heavier-than-air craft in existence, Several weeks past, this flying boat, officially known as the N. C. 1, made a flight off Rockaway, N. Y., carrying 50 passengers with ease. Its lifting capacity is said to be five tons.

The N. C. 1 is depicted in the accompanying illustra-

tions, which serve to give a good idea of its magnitude

and general design. It is and general design. It is equipped with three 12-cylinder Liberty engines, driving three four-bladed tractor serows. The wing spread is 120 feet. From prow to tail she is 70 feet long, and from the gunner's cockpit on the top wing to the keel is a distance of 25 feet. The distance between the upper and the lower planes is 12 feet, which also happens to be the depth or chord of the planes.

The scating arrangement is quite odd. In the center of the top wing is the observergunner's post, with nothing to interfere with his view and his shooting. pilot's quarters, provided with two seats and two sets of controls, are located in a nacelle between the planes.

Below the lower plane, seats for four are fixed, and below that the boat part of the plane has a capacity for a number of observers or passengers. As equipped for coast-guard duty, the plane carries 300 gallons of fuel, which is sufficient for many hours' flight. By doing away with the armament and other military equipment of the N. C. 1, its cruising range might be increased to 40 or 50 hours without

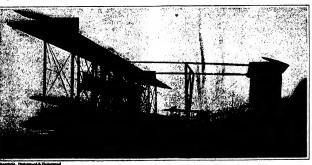
difficulty.
Given ideal weather and

good seamanship, the N. C. 1 or a similar craft ought to be able to make the transatlantic flight. In fact, it is generally held by those who know that such a flying boat can readily be prepared for the flight with every prospect of success. Because of its sturdy construction and its ability to alight on fairly rough water, the flying boat possesses many advantages over the land type of aircraft. In this connection Mr. Glenn H. Curtiss has recently remarked that marine flying will be developed quicker than land flying, because no new land-ing fields are required. Terminal facilities are already provided, for quiet harbors, rivers and small lakes are

2 Sept to Contract AND THE PARTY OF T The N. C. I flying boat as viewed from the rear, the three engines and their four-bladed tractor screws

> type as the old "America," equipped with two Rolls Royce or Liberty engines aggregating between 600 and 800 horse-power, and capable of maintaining themselves in the air and on the water for long periods.

> More recently our Navy has come into the possession of a still larger flying boat, designed and constructed by Glenn H. Curtiss, which may well be included in the



view of the giant seegime, showing the biplane tail with balanced elevators, at the end of the entrigers

(Continued on page 18)

Peace Parley Problems

What Should Be Done With the German Fleet

By Hudson Maxim

If a league of native set be practical or workable at wall be necessary to the Britain and the United States to agree up to the say of their respective mand building programs at it agree upon the size of their respective said prospective, like to five are unable to agree with Great Britis upon the division of the Geometric Consecution. German fleet we certainly can not hope to agree upon anything in the world especially upon a more difficult matter still that of the size of our respective future

buch a league t enforce peace would not be a peace league but a war breeding league if the two largest mations that are perfect to it are to enter upon a race for navil suprema to Nuch a race would in itself be The rivalry letwe r Germany and Creat Britain in fleet building was a war to the kinfe and the actual war with the kinfe can t in 1914 as the result of it. It momenths height of impolicy for us now to throw down the gauntlet to Great Britain and take up the race for

the gauntice to terral Britain and take up the race for naval suprimary where (many lett off). We need no defens against (reat Britain on the Atlantic any more than we have needed or now need any defense on the treat Lakes. We do not need to fortify the was to protect ounce less against Great Britain. any mor than we need to fortify the Great Takes With all her iket and all her armies Great Britain is utterly disarined against us because she would have nothing to win nothing to gain from any dissension or war with us but everything to lose

war with us but overything to lose

Grat Britain does not for the loss f Canala to us
otherwise she would want to fort fo the Crist Lakest

If Great Britain should go to war with us she would
inevitably loss the Dominion of Canada to us and that would more than offset any possible advantage that she could gain from the prowess of a superior fleet. No power on earth could stand before the American arms on this continent if we profit by the less ins of this war and prepare according to our needs

In the event that we am not agree with Great Britain with respect to the division of the German fighting ships why not sell them to some of the small nations who are building fighting ships and who would be glad to buy them? How about Brazil Argentina Chile

The money rused from these slups would go far toward reimbursing Great Britain for her losses and expenses in the war and we shald welcome an oppor-tunity to help Britain in this way. Britain that for the first three years of the war saved our land from the threat of invasion and spolistlon

Before the Great War we used to talk in millions when we discussed naval and military appropriations and re querusous navas and murary approj riations and congressional expenditures but since the war we have got so used to talking in billions that we have evidently lost much of our sense of proportion. A billion dellarlost much of our sense of proportion. A billion dollars represents a sum of money which to raise from the hun dred inillion American people would require a tax equal ures immon American people would require it alse equal to ten dollars for every man woman and child in the country. The German flect is certainly worth more than half a billion dollars. Now think of the silver folly of wantonly destroying property of stich colossal value while we go right on building new fighting slips.

If our naval program is carried out and we enter upon a race for naval supremacy with Great Britain as contemplated and keep up with Great Britain-because she will continue to build if we do- it means that the American people within the next ten or fifteen years will be obliged to bear a burden of taxation equal to fifty dollars a head for every man woman and child in the country amounting on the average to \$250 per family and there will be a colossal annual tax for the expense of upkeen maining and running such a navy
Is there no way to protect the interests of the American

people against such colossal folly!

No one can accuse me of being a small navy man am as strong for national defense as any man living. But the fact that the people of Great Britain and ourselves are mainly of the Anglo-Saxon breed with common ideas and ideals aims and ambitions is the strongest possible We should league ourselves with element of security We should kague ourselves with Britain as our own States are lengued to one another, and there should be no more cause to fear Britain than for one of our States to fear another State

Great Britain's fixed habit of good behavior is the greatest guarantee of world peace. It is greater than

any league of nations It must be borne in mind that Great Britain has more payy than she needs at the present time, and while we may need some naval increase we do not by any manner means need a navy as large as that

We must bear in mind the fact that Great Britain is differently situated from the United States of America If the continental area of the United States were to be it the continents area of the United States were to be out apart into as many islands as there are states, and there islands spread over the seas of the earth then we should be in a postton largely like that of Creat Britain, and we should then need a larger fleet than we now need up us as Britain needs a larger feet than we now need Britain a life is her fleet. Our life is within our continental confines and our fleet is an auxiliary. We could with a little time for adequate preparation defend ours? by indefinitely around the properties of the continents of the c

we could with a fittle time for adequate preparation defined ours tives indefinitely against the world in arms, even though our fleet should be destroyed and all our outlying possessions captured and we should also be able to feed ourselves for an indefinite period, even though all connection with the outside world should be

But Great Britain is situated otherwise. The British lsles and all her colonies would be absolutely at the intry of any one my that should be able to overcome her

We do not need so much of a ficet as does the widely we do not need so much of a fact as those show vices, statered British Empire In case of war with Britain, which is now an absurd supposition she could under no circumstances concentrate her entire feet upon any point of our shorts. We should still therefort, have a preponderance of fleet power where needed a power suffi-cient to protect the Panama Canal even though our fleet should be incomparably smaller than that of Bi

We need a feet in the Pacific Ocean of a size sufficient for our protection against any Asiatic Power or combi-nation of Powers With such a fleet we should be able to protect our continental areas from aggression from

any British flot t that might enter the Pacific
Although it is my opinion that war with Japan is now
most unlikely still I believe that we should have a fleet of sufficient size to make any war with Japan equally unlikely in the future Japan is so situated today that she could only lose by a war with us I he lapanese are far too win and practical to go to war with us

far too was and practical to go to war with us. In conclusion let me call attention to the pertaient fact that no American at the present time has the least fear of Great Britain. It is inconceivable that Great Britain abould take advantage of hor tremendous naval preponderance and her preponderance in highling men and munitions of war to commit any acts of aggression against us, much less to go to

Our comradeship with Great Britain in the war has Our collinacesing with orders britain in the war are bonded the two nations in strongest title of obligation fellowship and admiration, and this bend should now be utilised and jouned with the bond of a league to compel good behavior of all the nations of the world

It is time that the two great Anglo-Saxon nations should get together and stand for world welfare

Road vs. Load

DURING the stress of the past 18 months our high-ways have been used and abused as never before, and they have not always stood up well under thus treat-ment. The wear and tear of the constant passage, at maximum speed, of heavy trucks heavily loaded, and even of trains of such trucks, has taken a severe not built for such a streamous life

It has been obvious for some time that in mere self-It has been obvious for some time that in mere self-defense we should have to him the loads put upon our highways. It is all very well to say that the highways should be equal to the demands but thus is true only within proper limits. Every engineering structure has it mannium capacity. the Brooklyin Bridge will carry a given load and no more, the foundations of the Wool-worth Building will support a given weight, its walls will worth Studing will support a given weight, its walls will withstand a given wind-pressure, and no more. In cases like the last-named we can calculate in advance the greatest load ever possible, and provide a margin of safety above it but with the load is one imposed by human action as an the inflatmon of the bridge and the highway we can newer tell what demands will be made upon our struiture key dru successors, and so can never make certain that what we build shall continue to give service until it wears out naturally service until if wears out naturally

To the extent that roads built for passenger and farm

service are now being out to pieces by through and local

interurban freight traffic, the demand that such teaffic be regulated in a reasonable one. To the extent that reads built to support the normal trucking of five years ago are being torn apart by five- and test-ten trucks and long knes of vathers, that demand a reasonable. To the extent that no matter how strongly we build a fond, a load can be imposed that will break it down, that demand is reasonable. But—in meeting that demand we must be reasonable toward traffic as well as toward the read-builder having permitted the pendulum to eveing too far in the interests of the former, we will avert correct for an the interests of the former, we will avert correct durection. We want to drop it in the middle of its path, gruing to all concerned their just due. A Committee of the Highway Transport Commission of the Council of National Defense has discussed the question of a uniform traffic law for federal adoption or for recommendation to the various states. At present

question of a uniform traffic law for federal adoption or for recommendation to the various states. At present such traffic laws as cust are so different in different neighboring states and different in clattices as to cause confusion and annoyaire. If the Committee does not succeed in its efforts to bring order out of chaos, the continual snackment of further regulations by various local or state before may be experted.

local or state bodies may be experted.
At the present time there seems to be a tendency, on
the part of those interested, to favor a maximum load
of perhaps 12 or 14 toan per unit—the figures immaterial
it seems to us that this is not the intelligent treatment
of the case. Somebody has pointed out that the largest
tank or crawling tractor can travel over ground that
would be impassable for an ordnanity about lady—because would be impassable for an ordinarily stood aday—because while the machine weighs many times what the lady does, it has so much bearing surface that it brings less weight upon each square inch of its supporting ground than does milidd in her French heels and posted toes it seems no more than just to recognise this principle. in the matter of highway overloads

A weight that would smash cleanly through the road if

supported on old-fashioned buggy wheels, and that would cause serious wear and tear if transmitted to the road-surface through the ordinary truck tires, would be supported in perfect safety if it rolled along the highway on the traction belt of a crawler or even on the rollers of a steam-roller. So the sensible test for limit loads would

seem to be so much per tire inch

course there is a limit beyond which unit loads should not go—sumply because there as a limit beyond which distribution cannot go A load of 1,000 tons would be supported without damage by any roadway, if it were of sufficiently wide distribution But so 1,000 ton load sould be sufficiently widely distributed while remaining mobile on wheels or substitutes therefor remaining mobile on wheels or substitutes therefor so it would be proper enough to specify that no axis shall bear more than a certain lond, and that no two axies shall be less than a certain number of inches apart. But this is as far as the restriction of unit loads on blunds

Again, experience has shown that a tire which is not Again, experence has shown that a tre which a not mighest to tractive strain need not be more than half as wide, for a given weight as one that is subjected to tracion. Therefore, should a right recommendation be made for a certain limit weight per tire-inch, it would not be fair to the trailer owner who would then have to use bigger tires on his trailer than necessary. In fact, the time themselves afford excellent argument in favor of this course. There is no better way to tall the relative damage done to the road by various classes of rought than by assuming that the highway suffers in proportion as the teres suffer. In other words, if a dual 6-tich live on a driving wheel and a ample 6-tinch tire on a non-tractive wheel wear out at the same time, it is safe to action the son. a triving wreet and a langue o-men hire on a non-tractive wheel wear out at the same time, it is ease to assume that the one has done about the same damage to the highway as the other. On this bests, the maximum weight per ture unch should be set at one figure for wheels he which power is applied, and at a higher figure for non-imactive or the state of t

whoels. Figures that have been suggested by one well-informed person are 500 and 1,300 pounds per tire inch for these two classes, respectively. From the same source comes the specific renormandation that no acid be permitted to carry more than nine tons, and that no acid be set elsew than 100 inches. The important thing about all this, however, it not so much the figures are it is the ideas involved. To all busiles that are contemplating legislation designed to relieve our rease from the destruction that has been wrought upon them by excessive inseter careful, we semestly commend that limited the busiles set facilities.

Review of the year 1918

(Continued from page 8)

before we were told of the wireless telephone which paramitted the orders to be issued from a ground station Badio communication over long distances has been greatly improved by numerous mventions which, on the whole, remain military secrets fitstut the archenemy of long-distance waveless, has been definitely conquered, according to a recent announcement of the Marconi organization, and the tall mests and elevated automa usually uses cited with radio have been replaced by low masts and an tenne, marking a new era in this breach of communication. and of communication .

breads of communication.

Not to be outdoor by radio, the land lines have come in for a number of improvements, among them a new multiplex system which permits of increasing many fold the present islephone and telegraph capacity of wires actionsatic telephony has come to the front in a big way, and because of the severe shortage of help the largest telephone companies have had to consider the sutematic telephone for use in the leading cities. In the flad of electric illumination, the progress has been considerable. Flood-lighting has found now provided to the control of the control of

Militarity, there was little achieved in the electrical Bald; for, as already stated, this force is a peaceful force However, in the course of the past year the Germans introduced their crewless raiders in attacks on the British monitors operating off Flanders Thus they put into practice an idea which was by no means new, but fortunately, thanks to the vagilance of the British put into practice an idea waten was by no means new, but fortunately, thanks to the vigilance of the British craws, nothing came of the German scheme On land electricity found such military uses as charged wire antangiaments, improved X-ray outfits and portable lighting plants

The past year has been a great one for seronautics Vast strides were achieved in practically every branch of the flying art, and the twelve months of unpercedented affort were fittingly crowned by the fifteenth anniversary of the first flight by the Wright brothers, which took place in the sand dune of Kitty Hawi, N. C., during Documber, 1000 by the demonder of the military land.

Spured on by the demands of the military leaders, the leading acronautic constructors statisned their divers goals just prior to the signing of the armistuce primit planes for fighting purposes had been developed to a point where a speed of 128 to 150 miles an hour was a fest accomple rather than a product of finagination Giant planes of the long-distance bombing type were beginning to make their appearance in wast numbers Germany had constructed a number of Gotha-Lesens planes capable of carrying fire tons of bombing points out of the purpose of bombing points out of parts. Handley-Page machines fully as large as any German plane, for reparing Germany in its own oom. The Albes had contracted extens feets of small and meduma-ward dirpthies Spurred on by the demands of the military leaders, ing Germany in its own com. The Allies had constructed entire floets of small and medium-sized dirigibles for naval work, as well as numerous large and fast flying for nava wors, a well as minimized as the state of the photose carrying thousands of pounds of explosive for the limiting U-bosts. The armament of fighting planes had been developed to a high degree, so that some planes carried as many as an guns, and few had less than two All in all, and from a military and naval point of view, the seronautical constructors have quite fulfilled all of

America's progress has been stupendous during the past 12 months. After many disappointments and set-backs, our serial program at last got under way. Thou-sands upon thousands of Liberty motors and De Haviland money our serial program as tast got under way. Thousands quit shousands of Liberty motors and De Haviland invo-sestes made their way to our battle lines in France, where the unanch of pilors and other serial personnel were ready to man them Also, our sewralt constructions succeeded in turning out excellent copies of the British Handley-Rays and the Halan Capronis, equipped with the Liberty motors. Our Newy completed with Halandy-Rays and the Halan Capronis, equipped with the Liberty motors. Our Newy completions gain from the Liberty motors. Our Newy completions gain the Liberty motors. Our Newy completions gain the Liberty motors. Our Part of the Liberty motors in the Capronis of the Liberty motors. The Liberty motors have been introduced during the past year. The winged postures is dust become quite summonplace, with one route sign manufacture of the liberty motors of the later month of the past year. The regards have seems front all the beligueent sountres tabling at the year efforts being expended in converting the plants of the way the rightness of pasce. All of which prestraint, most for the believe of aeronautique.

Chieffith.

injustration of the year's chemical advances has

Reactions which in the laboratory proceed in test tubes have been put upon a commercial basis of quantity of production that would astound the chemist of a genera-tion ago, who would perhaps fall to recognize the opera-tions as those of chemistry at all so altered is the method of attack. The years developments have been so strongly along these lines that we must catalog them in

strongly along these lines that we must catalog them in terms rather of the factory than of the laboratory. The coal-tar chemist assures us that he has solved the last of his big problems of dye manufacture. The knowledge of principles and methods gained by the Germans has been so systematically withheld, and even falsified, that that knowledge cannot be said to have constituted part of the general body of securic The labors of the past three years crowned by the results of 1018 have mediated under the control of the past three years. 1918, have m de it such a part

In glass-making the years developments are even nn gnos-making the year a developments are even more striking, glass is produced today superior to anything ever known, both for optical and for other use Our ability to handle paper Nature a composite has been advanced far, so that this substance is inding a surprising variety of new uses. By an alliance between the elemist and the mechanical engineer the process of dehydration, which means so much in the world's food supply, has been put on a solid foundation. At the same the chemist has made the world less dependent on a single cereal by showing us how to make good bread with a minimum of wheat

As a result of concentration upon the problems of gas warfare, a large and valuable hody of knowledge has been built up with reference to the toxic effects of a wide variety of poisons, and the proper antidotal and preventive measures. At the same time a number of commercial gases have been developed and some old ones are being manufactured at a fraction of their former

Among the purely research activities completed during Among use purely research in invites complete during the year, we must ment into two undertakings of the Bureau of Mines The first brings (sheaper radium closes to realisation, the second identifies the character istic property of selmum in a number of other metals and oxides all of which show an electro resistancy vary ing more or less markedly under the influence of light

Under this unclassified heading perhaps the most important thing to chronicle is the acceptance of the motion picture as a new scientific instrument coupled with the microscope at normal or abnormal speeds, as a means of actual research or as an agent for proving results and spreading knowledge thereof the moving film has this year proved its place it now ranks with the camera and the introscope as one of the recognised optical tools of science

rhaps in no field of science has the war stimulated such sudden and such notable advances as in that of the psychologist He has had unprecedented op-portunity to observe the behavior of men under con dutions of stress and he has been called on to make tests, and perforce to device purlames and methods of test, on a scale never before contemplated proved his technique to himself and to others so that now stands on a level of acha vement and recognition that he could not have attamed in years of normal

Other interesting developments of the year include Other interesting developments of the year include quantitative spectrum analysis and magnetic analysis. The former makes available as an accurate means of determining becomingse, what has hitherito vasted only as a means of preliminary qualitative test the second opens up a broad field to the strength-of maternias sugment, who has seldom been alst to devuse a test that did not destroy the material subjected to it.

At first blush, one would be inclined to class the work of the astronomer among the non-essential occupations. To be sure, his studies take him far beyond the may mis-To be sure, and studies take him for beyond the insurint-cent speck of the universe which is our jabilita ion Nevertheless, thuy as is our earth, to us who cwell thereon, the swants of the past four years have bet a of paramount importance. But in reviewing the recent work of satironnesses we find that they have taken a very paramount importance But in reviewing the receiver with of astronomers we find that they have taken a very work of astronomers we find that they have taken a very and of our Allies have been very hour teaching in the navagation schools, besting operals instruments improving the work sof the raise finder and even operating at the very Frint. Despite the handcaps of war a considerable amount of research work has been done in the past year. Two comets were discovered, the first at Cape Torm, by Reid, on June 12th, and the second by Geherr, at the Eastburg Observatory, on November 22d cheer, at the Eastburg Observatory, on November 22d the sun, he arrived at the startling conclusion that there is wakey wayer and sagmons vapor in the sun a atmothe sun, he arrived at the starting concilient that terms is water vapor and shipments vapor in the sun a atmosphere. Heretofore, it had been supposed that the meanes heat of this luminary would prevent the formation of any elemical compounds, but this supposition

needs revision in the light of Fowler's researches Long photographic exposures lasting 70 hours have shown that the inner portion of the nebula of Aidr neils rotates at a speed of 50 miles per second from which it is estimated that the outer portion probably at uns a speed of 200 miles per second. A small star rear Alpha Centauri lays claim to being our nearst companier Its distance has been estimated a between 41 and 13 light years from us It is a cool star only one thousan lib part as bright as the sun

During the year there were three compses of the sur and one of the moon. The most amportant echase was that which took place on June 8th when the shadow of the moon event across the Hutted States from Oregon to Florida in a belt from 70 miles to 50 miles in width as the first total eclipse that we have had since May By a remarkable concidence on the day of the eclipse a new star was discovered in the constellation of Aquila, which was the brightest star to make its appearance in the last three centuries lit reached the magnitude of 1.4 almost that of Sirius Photographic records of that portion of the sky taken at Harvard I inversity show that on June 3d it was of normal brightness Owing to cloudy weather that region was not photographed again until the 6th when the star appeared had increased 200 times and it was clearly visible to the naked eye—in fact there are reports of its having been seen although the news was not transmitted to any of the astronomical observatorica of the 7th and 8th its brightness had increased 100 000 times and then it was so conspicuous an object that times and their is was so compared as a correct man-reports of its discovery were telegraphed to Harvard Observatory from all parts of the country Another nova was rported on February 4th in Monocores which reached a magnitude 54 on Jacoury 1st although its magnitude was 85 when discovered. In March Wolff magnitude was 85 when discovered. In March Wolff reported a faint object which at first was thought to be a comet but it proved to be an asteroid with a period of four years. This tiny member of the solar family has a four years. This tiny member of the solar family has a dismeter of but two and a half miles. After having been greatly delayed by the war the

Smithsoman Institution has at last established a solar constant station at (slams (bile at an altitude of

Proposed Swiss National Trade-Mark

COP's of the regulations under which it is proposed A by Swiss chumbers of commerce to establish a Swiss national trade mark under the name of S P F S (Syndicat pour 11 xportation Susse) discloses the fact that the mark will be confined to firms two-thirds of whose capital is Swiss and to goods that are made in Switzerland exclusively by the Swiss Thus any foreigners manufacturing in Switzerland will not be able toregners manufacturing in Switzerland will not be able to use this trade mark for goods manufactured by them in Switzerland. Ih object of the trade mark, it is stated is not to place foreigners at a disadvantage, but to ensure that any article bearing S. P. F. S. are to be really of Swiss manufacture. In addition the mark really of wise manufacture in addition the mark is directed against German penetration, as numerous firms are known to be ostensibly Swiss, but in relity German. The president of the Geneva Chamber of Commerce states that the control of these will not be easy but the committee is alive to the probability of improper use of the mark and they consider that it will improper uss of the mark and they consader that it will be necessary for Yssus manufacturers to bring cases of this character to official notice. No foreign firms are to be prevented from manufacturing in Switzerland but not being Swiss, they are to be debarred from using the trade mark. With regard to the possibility of the extensive missis of the trade-mark [by exporting merchants it may be necessary to add the manufacturer's name to the trade-mark This may not be acceptable to exporters and if impracticable and the trade-mark fails as a result to protect bwiss manufacturers, it is con-sidered probable that the chambers of commerce concerned will propose its abolition

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The Dogs of War

What the Canine Has Contributed Toward the Allied Victory

THE dog may well be proud of his splended record in the great war. For while acknowledging the great services rendered by other military animals such as the horse mule and arrier pigeon the dog has the distinction of having served in the front line trenches and even out in No Man's I and where only the bravest dand vinture

It was quite natural for the Belgians to employ dogs in military operati us as they had been doing in the days of peace So early in the war the Belgian machine gons were mounted on light carts and drawn by trained dogs with the result that the few machine guns availal to the Belgian army accounted for more than their due share of German invaders because of their extreme mobility

Other armies soon introduced trained dogs

of the range soon introduce trained dogs in their organisation using them as watch dogs and despatch carriers at first and later for carrying to 1 and ammunition to the first line as well as medical supplies to the wounded lying about the battle fields Indeed the dogs have constituted a distinct and recognized branch of each of the leading armics with recruiting bureaus training camps ex-quarters behind the lines and claborate hospitals

During the last days of the great war the I rench army had some 10 000 dogs in active service. These canines were employed as sentincis out in No Man's Land where the keen senses of these four legged com Land where the con scheep of freet four right down betants parse warning of hostik provices long before they could be detected by the polus. Dogs were also employed to guard prisoners and thanks to carful training, in distinguishing the polul from the Boche canner guards were used to a considerable oxient thus



One of the extensive kennel parks for the messenger dogs serving with the British armies in Prance

relieving large numbers of French soldiers for more important duties. Still another use for the war dogs was in the carrying of despatches across territory under fire As a lasson agent the dog was found to be without equal for these four-legged country passed unfalter-ingly through barrages and areas under machine gun fir, where it would have been worth a man a life Even in gas souked territory the dog couriers were employed in gas sourced territory the dog coursers were employed being equip ped with special gas marks for just such cr cumstants. And then there is the all important ques ton of maintaining the supplies in front line positions under enemy fire. Here again the dogs served ad mirably in bringing up food and ammunition to the beleaguered troops

It has long but n recognized that the question of n

taining supplies is one of the most diffi-cult to solve in the usual trench opera-tions. By the use of an intense stiller-harrage it is possible for an enemy t-isolate any green bit of trench system-almost as effectively as if his troop concrided it. Apprenating the possibilities of the war dog as a carrier of supplies is small quantities the French worked on the amai quantities the French worked on the form of supply service. Special harnesse and carrying pouches were developed to all kinds of supplies and dogs were traine to carry various articles ranging from ho soup to hand groundes for the trench de lenders.

The results of some of those studies a The results of some of these studies as ahown in the accompanying group o photographs made at the Franch military that the companying and the franch military and the companying control of the second view shows a four-legged ammuniton carrier in this case provided with pouches holding the apply of greates shown beautiful military with his label of the companying and the short of the companying and the companyi

It will be recalled that in previous descriptions and discussions of this small cannon which is a form of so called accompanying artillery, the difficulty of maintain ing a steady and adequate shell supply has been pointed out in these columns Apparently the French have

The poilu who is a tremendous bread eater, receive his daily bread up in the front-line trenches—German barrage or no barrage—thanks to the services of the do



shown in the fifth view. This dog carries is loave in one try. Likewise the machine game, which simply derour cartridge belts or clips, must be supplied constantly if a poution is to be held. And have is where the dog shown in the sixth view comes in for his share of service carrying 250 rounds of ammunition at a time. In the ensiter of curth view appears a row of kennels at Camp Satory. During the year 1017, owe were returned war dogs were treated for wounds and aliments, of which 4,168 were returned dog spotialists of France are engaged in carring for the thousands of war dogs and the medical and surgical facilities, as shown in the view to the right, leave hith to be desired.

The war dog has a distinct application The war dog has a distinct application in the resonstruction period of France and other countries. As a companion and guide for the blind soldier, the trained dog continues to serve the nation. For the wounded, there have been developed that the applications of the server of the se light two-wheeled carts drawn by one or two trained dogs, and it may be that vehicles of that kind will be the means of abling many a crippled warrior getting

about in the coming days of peace A war police duty the war dog is well fitted with practically no additional training, in fact the first war dogs came from the police departments of Pazis and other leading cuties of France

It so happens that the writer has come into the precession of facts and figures concerning the French war ogs only but there can be no doubt that the British and cogs only but there can be no count that the stream and the Garman armine have employed dogs just as extensively and thoroughly. There has been no monopoly in the enightment of dogs in the great military operations on all fronts and once again the dog has proved to be man a greatest friend among all animals.

Molded Airplane Propellers

IT is customary to make airplane pro-pellers of laminated wood. Layers of veneer of various woods carefully se according to various qualifications of ten sile and compressive strength and of toughness are cemented together and built toughness are cemented together and built up into a solid block, out of which a propeller is carved. One disadvantage of this system is the fact that the propeller blade has a lamnated surface and the edge of the laminations on the working face of the blade are required to strike the air as the propeller is revolved, and there is danger of ditting them apart
To overcome this objection a molded

propeller was designed and found consider-able use abroad, as well as a certain amount of limited use in this country during the war. In this type of propeller the laminations are twisted to the proper form and then are comented together so that the working face of the propeller represents an unout surface of veneer The method of forming these propellers is illustrated in the accompanying engravings. The layers of veneer the accompanying engravings. The layers of veneer are laid upon a block of wood shaped to the form of the



A war dog on the operating table at the military dog hospital, Camp Satory

working face of the propeller Between the lower three wooden layers, that is, the ones adjacent to the working face, there is an interlining of linen. The layers are comented with a glue made of coarm and line. This is mixed in a high speed churn just before using and has to be applied within fifteen minutes of the tip cit is mixed. The cement is applied cold. The laminations of the propeller are firmly clamped by means of wooden blocks.

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Stages in the construction of the molded propeller

as shown in the photograph. In this position, the propellicr is allowed to set. The glue is of such a nature that it will not be affected by heat or by mosature. The propellers may be boiled for hours without showing any tendency for the laminations to separate. After the cement has completely hardened the back of the propeller is shaped by hand but the working face is practically untouched. The propeller is then given an impregnating bath to close the pores of the wood and then pigskin rawhide is shrunk over the outer ends. The final operation is to varnish the propeller

By this means of construction it possible to obtain a much narrower hub and by setting two propellers at right angles one to the other a four bladed propeller is obtained with a thickness of bub scarcely greater than that of the com mon two blade i ; repeller

The Current Supplement

THERE are vist expanses of country in South America that have never been visited by white men and about which little or nothing is definitely known One such region has in the interior of Venezuela and is inhabited by tribes of the Motiline Indians who have been reputed even from the times of the carly Spanish adventurers as the most warlike and dangerous of any of the inhabitants of the continent Last summer an American explorer succeeded in penetrating this region where he spent some time with the natives and an account of his adventurous observations will be told in the Scientific American Strply MENT the first installment appearing in the current issue No 2244 for January 4th under the title of The Macon Indians of

The narrative is acc inpanied by a number of original photographs taken by the author Many about which scientists have but slight knowledge it has been discovered that these pigments serve other useful and necessary functions besides that of decoration Some account of the subject will be found in a paper on The Anthocyanin Figments in Plants The Oyster Feeds Both Man and Plants tells how the shells of

Both Man an Plants tells how the shells of these popular by valves are utilized as a valuable fertilizer and it is accompanic if by a number of photographs. Another interesting paper is on A Pisched Raceball which explains and illustrates the ration ale of its many freaks. Other articles of interest in this issue include Vibration Mechanical Musical and Electrical I in formity in Aerographic Records Dies in Jormiy in Arographic Records Dyes in I holography The Probable Trend of Aer-plane Design (val Gas for Motor Vehicles ir England Dangers of Explosion with Infimmable Lapors Tree Wasps and The Relations of Light and Health

South African Geographical Society

THE South African Geographical a wid range of activities and has already launched a magazine the South African Geographical Journal The society plans to establish a geographical museum and library contain

so cessions a geographical missent and nursary containing commercial and industrial specimens from all parts of the would besides hooks maps etc. It also proposes to promote 'floating exhibitions whereby samples of commedutes may be brought to South Africa from other countries and samples of 'South Africa products so it shroad 'croographical education is to be fostered and shroad 'croographical education is to be fostered and it is hoped to establish traveling scholarships







Removing the surplus wood from the back of the propoller

World Markets for American Manufactures

Edited by LYNN W MEEKINS

A department devoted to the extension of American trade in foreign lands

The Adaptable French Soldier

It has been proved in reithin once turing the last four years that it breach would rethre high than eat. But now that it kaineral borns has ended the war they have gib lack to the firm and further girls it breach soilly casein, shell holes with plowed

girth I French sont ty classing such noise with power forrows from which boundful or jaw all spring I odds, the farms of France need implies mis said equipment of many kinds from hose to harvesting in admirty. The I French Departments or political divisions are taking active measures to promite the back to the land movement. This is being dure by offering at-Programment of the Lore for metance a minimum of from 20 to 25 acres may be allotted to each man not over 15 years of age, who will promise to remain 10 years at th head of his farm. He will be supplied with about \$200 worth of modern implements and loaned additional equipment not exceeding \$400 in value for which he has 15 years to pay In order to encourage large families part of this will be canceled according to the number of children born after the farmer has taken possession of his allotment of land. I rough milk and factories need workmen but the actual restoration of the country is squarely up to the farmer and agriculture has replaced military service as a patriotic duty

Two Factors Limit the Market

The American manufacturer of implements and ma chinery however should not overestimate his op-portunities for stocking French farms with his products. In the first place French manufacturers, more familiar

with the different kinds of soil in their country are meeting with much suc-cess in turning out the equipment best suited to it. That the domestic makers are not going to let the United States run away with the trade is shown by a statement of the President snown by a statement of the Freud at a of the Syndheatt of Implement Manu-facturers who said that 'if the Muns-try of Agriculture will lay down a set program we will undertake to furnish French machines corresponding to the type of American machine ing to the type of American machine indicated as a model and of equal quality at an equal price even if we have to make sacrifices to do it in the second place the French Government has no intention of countenancing extravagance and to prevent the competitive bidding that would result in it all buying is closely

the Paris representative of an American machinery corporation who recently visited the United States, consortiums or in-

dustrial associations for importing various lines. The farmer who needs a harvesting machine applies to the consortium desiing in farm implements If it cannot be supplied by a French manufacturer the organization will import it and the American manufacturer may sell it through this means

its many vineyards and small estates—are favorable for the introduction and sale of horse-drawn cultivators, harrows plows and other implements. Most sections of France though are calling for tractors and this is the line offering the principal opportunity to the American manufacturer

Isles of Plenty

T'S good to see the sugar bowl on the table again! remarked a prominent exporter at lunchoon the other day Just think for a moment what that signifies We are receiving more signifies We are receiving more signs from abroad and the welcome sinps that bring it can take more of and the wearome ships that bring it can take more of our goods back to the sugar-producing countries, which are elamoring for them and have ample messay to pay for them With Cuba nearby across the Strats of Florida, the United States is doing a vast amount of

with the Dutch Fast Indies, far across the business with the Dutch Fast indice, iar across one Pacific Ocean we can build a large and profitable trade if we go after it. The latter market is of particular interest because it offers valuable raw materials— rubber in vegetable oils and fibers—in sexchange for all sorts of American manufactures. It is the world's all sorts of American manufactures It is the world a third largest purchaser of cotton cloth it needs con-siderable quantities of modern machinery for sugar-plantations for a rapidly governing oil industry, and for mining and there is no limit to the prospect for the sale of medium-priced automobiles are mong our most distant the Dutch East Indies are among our most distant customers and our business with them can never be of

ruscomers and our ounness with nem can never so ut the mail-order variety. Nevertheless, it is comparatively easy to trade with them because most of the important firms have opened branch offices in the United States to buy our goods and to sell theirs as the respective lines are non-competitive. It is a great advantage to both countries to conduct trade in this way.

How Germany Obtained East Indian Bus

The Dutch have always been among the world a great The Dutch have always been among the world a great randers. Before the war both the Netherlands and its best Indian possessions dealt chiefly with Germany The reason for this is obvious. Germany a railroad extend to the looder of Holland its waterways traverse that country. It is not simple for Germany to deal with Holland as it is for the United States to trade with Canada and Holland of course controls the trade of its colonies which have an area St tunes as great that of the mother country and a population more than six times as large American trade with the Dutch The lack of an American merchant matine before the war enabled the Dutch to carry our shipments to the East Indees by way of Holland With our own ships, and with the development of sufficient interest among American exporters, we can retain and add to our present direct commerce The "Shipment Sample" Is Imp

One American firm has built a successful bunness with the Dutch East Indes in this way. A representative was sent to that territory with a full line of samples. He showed the colonial merchants just what his firm had so showed the colonial merchants just what his firm had loo offer, and he received surprangly large untils orders. In making shipment, the method of packing specified by such customer was carefully followed Resconsible credit was extended Because b was on the ground, the sakeman learned of the value of the "shipment sample". This does not represent the groods to be shipped in the future, but it is taken directly from the actual shipment as it goes forward. When the construction of the shipment is a single property of the proof of the shipment as many constructions of the shipment as many constructions. Need-the set one, reddless difficulty is caused if there is the alightest difference between the 'shipment sample' and the goods.

aligness discrete discrete the goods

The president of one of the largest trading houses in
The president of one of the largest trading houses in
The president arrived in the United States to make
arrangements for the establishment of direct steamnibly
here between New York and the Dutch East Indies and between San Francisco and those colonies He believes that the only two factors necessary for material ad-vances in American-Dutch East Indian

commerce are cooperation and ships

Can We Sell Electrical Goods in France?

THE world's coal supply has been thrown out of gear by the events of the war, and the use of hydroelectric power has advanced rapidly lelectricity as as great labor-saving source will have much to do with the coconstruction of France and Belgium, and it would seem that American and it would seem that American and its world seem that American will be called upon for manufactures will be called upon amanufactures will be called upon any alectroal devices. An engineer who has made a close study of the Freuch market for 25 years believes that material, if not radical, changes that material, if not radical, changes that material, if not radical was not not to the state of the state American exporters who expect to dispose of their goods in France, where the methods of installation and

American exporters who export to dispose of their goods in Franco the dispose of their goods in Franco the standards of quality are old-habitoned, to say the least. Ten years got, thus engineer étaid, there was not a magie electrical winn justilation in France that would pass the requirements of the National Board of Fire Undewruters in the Unstell States. "American methods and materials make the cost per outles probabilitied by many and a French importers," and electronal supplies. Booame cardesances is not a national trait with a the fire losses due to electronal installations in Franco are not one-tenth as great as the inseas from similar scates in the United States, in spirit of our crude deveces, so we naturally think that such deveces are good enough. If Americans will thank simple and has perfect appliances which will be changer to produce, thereby lowering the selling perior. In Presche markets offers are the importer thinks that push-button switches of the American will are the proposed as personal to the control of the selling perior, the Presche markets of the American type would be regarded as between, in France, where the average force of out-out now used would probably not have been allewed in the United States even if years age. The wiring of French fictions is very infection in American type to the Presche States in the Presche theorem in Presche conducts being understaller to the Presche States is severy infection in American products and the American type of the Presch States is the Presche theorem in better the Presche States, and the States is severy infection in American products and the American type of the Presch States is severy infection in American products and the Presche States and American type in December 10 to 10 to



American three-horse kurvester used in France

East Indies used to pass through Holland, but the war East Indies used to pass through Holland, but the war interrupted communication between the Notherlands and the East Indies so that although the mother country continued to be dependent largely upon Cermany for its imports the colonies had to lean upon the United States and Japan, each of which has increased its ex-ports to the islands about 300 per cent during the last two years.

American exporters did not seek this large volume of business. They failed to study the requirements of the market and they did not push their lines systematically, so the Dutch colonial merchants came to us, and it will be decidedly to our advantage to make them welcome Java a Market for Quality Goods

Java a Market for Quality Goods

Commercially Java as four-fifths of the Dutch East
Index I is the logical length center for the archipelage
Batava and forenhays are the principal parted. My leading the control of the principal parted of the properties of the public East lattices want quality goods, and flow patronage far well worth while there as particulate demand for calculate the properties of the properties in the properties of the pro at 150,000,000 tons, a fine opportunity is offered.

A Natural Derrick Mast

IN connection with the recent unpleasantness, it was found secessary, as pointed out in the public prints from time to time, to get out from the forests of the American northwest a great deal of lumber with the unmost naste One lumbering concern in the state of Washington hit on an ingenious expedient for saving time with each change of location—doubtless an ex-pedient that has been employed before, but never, we suspect, upon such a scale or in such a deliberate manner Wherever it was necessary to have a destrick, search

suggest, upon such a scale or in such a deliberate manner Wisserver: It was necessary to have a derrich, search was instituted for a tree sufficiently tail and supplied to the search of the sear

Growing Cotton for Tires

THAT an affinity should exist between automobiles

A and cotton seems unbelievable, but the fact remains
that one of the largest tire manufacturing companies world has found it necessary to go into the bu of raising oction of a superior quality in order to insure an adequate supply to meet the increasing needs of its factory. That this is true is but another example of an adequate supply to meet the increasing neous on inforcory. That this is true is but another example of the complex nature of modern business, where one moderty is vitally dependent upon another apparently as far resmoved as the poles. In the manufacture of autoscioble idees not of the chair exquanter is inogrataple coston, a variety that is exceedingly valiable and hard togst. Until a few years ago noses of this variety was produced in this count, a morphily Egypt. The present modern of the county of the content of the county of the content of the county of the count

throughout the Bouts, we have continued to the Bouts, we have cotton whose others grow to unusual length such as Sas lakend and Egyptian varieties. To produce this long-staple outcom requires the continued observance of a number of conditions unusually beyond the power of a word of the summer of the power of the summer of the of any one grower to maintain It requires community growing to insure an adequate supply of pure seed, to keep out weed and insect enemies, to turn out from the keep out woed and meet enemies, to turn out from the gin a smooth sample without defects, and to establish a reputation for a consistently high quality of cotton The principal advantage which the Fgyphian growers have over those of other parts of the world is that they have absolutely definite standards or grades, which are known all over the world and which can be depended upon by all better world and which can be depended

Having determined upon the enterprise, the tire com-pany, after investigations, decided upon the Salt River desided upon the sain taver valley, in Armona, as the scene of their operations Here elimatic conditions were favorable, an abundant water supply was assured by he great Roosevelt Dam mearby, and a sufficently large soreege was available to insure the estafactory working out of all secondary details. Some of the 35,000 acres sequired had previously been ecoped to alfalfa but a large portion was wingin desert which had to be re-chained. A waker system by, and a sufficiently ed. A water system red to reach every pordanted to ection as fast as thomsacis of workers will be supplyed in the fish when the pictors is recognists. Free gint have been eved to handle she product, and is the interstein of these elegans of the work to tall system specially in the work to tall specially specially the work to tall specially specially the work to tall specially specially the work to tall the sum of the second special special



Using a big tree for a derrick mast

crushed for oil and the by pr ducts fed to stock. It is thought that even the stalks can be utilized in the man

thought that even the stalks car be utshed in the man feature of a substitute for purp pulp. The Salt River Valley priject will be a cooperative one in every way. The company will partially finance local settlers who engage in outon lawing under the preserved conditions and will provide for the marketing of the product. The continued production of a crop with a fixed had quality of here is a big problem and with a fixed had quality of here is a big problem and with a fixed had quality of here is a big problem and the basic. The grown alone connect elect to stabilize too of the cotton, industry in his community. I be ginner must devote his mill eviluavely to the gnining of long-staple varieties, as otherwise pure seed and a un long-staple varieties, as otherwise pure seed and a uniform fiber cannot be maintained. The banker must help ause he must stand ready to lend his money to the producer during the long growing stason. Luthermore each grower must use every effort to keep out of the district the plant diseases and encines so prevalent in ordinary cotton districts

In staple and quality of fiber the American grown cotton is commarable with the best varieties produced in Egypt In both countries the cost of production is about the same, for what the Fgyptian saves in labor cost is made up by the American in the utilization of labor-saving machines | The crop producing capal intreof the land are about the same in each case. A g is production is a balk in sere worth from \$1.0 to \$4.00 of the great difficulties confronting the gr w s f the long-staple cott n in this country is the suit at adequate supply of pure sect. At the present tine the supply is much below the demand at 1 pir es ar higher than at any time in the history of the oft n in

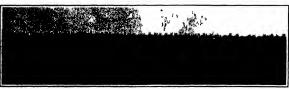
Egyptian cotton in length of stapl between average Sea Island and ever get pland in the ary American) cotton. It has however certain har ter American) cotton. It has nowever certain har for states which cause it to be in lemand ven in the linted states where during recent years Lagitimi cett i has comprised about 80 per cert of all imp retect oftons. These special qualities are its finenses strength clustering and great natural twist which combined coable it to make very him, attrices very a midel to the passifications. make very fine strong yarns suited to the immufacture of the better qualities of hosacry for mixing with silk and wool and for the making of lace. It also increasizes

Climate conditions in Egypt differ radically from those existing in the cotton belt of the United States but closely approximate those obtaining in Arizona and in southern approximate those obtaining infarizons and in southers of califorms. The ramfall in Lygyt is very annual and is quite manfalling the Niel Delin during the growing season yet Egypt stands third in the cotton producing countries of the world. I laborate irragation works supply the cotton fields with the necessity water and this continuous distributions almost displication with laborate irragation works supply the cotton fields with the necessity water and this continuous distributions almost displication the long-staph districts of the Sait River Valley and the Imperial Valley in this Sait River Valley and the Imperial Valley in this section. 1 800 000 acres and nine tenths of it is in the Nile Delta the delta soil is typically a heavy black alluvial clay very fertile but difficult to work. The soil in the cotton districts of Arisona is in many respects similar to that of Lgypt and with climatic conditions irrigation type of soil and other elements needed for successful cotton growing almost identical with those found in Fgypt there is no ruson why the United States should not be able to produce all the long-staple cotton it consumes within its own borders

from the cotton raised the utilization of the by-products obtained from the cotton seed will greatly add to the financial returns of the growers as a variety of valuable products are now obtained from the seed For every pound of cotton produced for the market there are two pounds of cottor seed. Until a few years ago these seeds were considered as worthless and the problem these secon were considered as workness and the phoblem of their disposal was a tring out. In the vicinity of every gan were huge piles of cotton set of left to rot and produce an offenness odor. Some of it was used to frethiz the fields but the great hulk was dumped into streams, burned or otherwase wasted. But this is all changed now. The said is either manufactured into vigitable oils and stock foods or if it is left on the plantations it is entirely utilized as feed for

stock or for fertilizer analysis of ordinary Unland cotton seed shows that it is nich in nitrogen phosphoric acid and potash The Egyptian cotton seed is even more valuable for its them ical constituents. Compared with commercial fertilizers it is estimated a ton of cot-ton seed is worth at least \$10

the best grades of cotton ed oil are used as a substitute for olive oil or lard and the poorer grades are employed in the manufacture of soap candles and phono graph records Recent ex-pertments have shown that flour made from cotton seed when mixed with wheat, makes a pulatable and nu tritious bread (often seed meal or cake to one of the and it has from three to four times more proteins about times as much ash or bone material as corn or oats Even the cotton seed buils which remain after the mill ing process are utilized in feeding stock and in the vicinity of the big mills of the Youth it is customary to find large establishments for the feeding of thousands of head of stock for market



Plewing the fields for cotton to make tires



A field of raung potton on the tire farm in Arisona

The Heavens for January, 1919

A Group of Stars of Extraordinary Proportions

By Professor Henry Norris Russell, Ph.D.

WITH the opening of the new year men of science like all others or gradually settling down to their old pursuits and o copations but it will be several worths before the control of the c months before this return to work is rellected in an increase in the now diminished volume of scientific papers and one who like the writer g to an opportunity to look over the current literature (11) at longer intervals than usual still finds himself surprised at the small amount of new material that comes in month by month

amount of new material that comes in month by month.
This is very much as it should be at the close of this overwhelmingly eventful year. Yet on second thought it is remarkable not how little has been added to astronomical literature but how much. And while this is true of the United States at is still more conspicuously so in I ngland. The number and the high quality of the papers which have been published by the Royal Astropapers which have need published by the rowal astro-nomical Society of I ondon during this fourth year of the war, are truly annuing. In fairness to our defeated fore-we must recognize too that astronomical work of real value and considerable amount has been done in Germany

value and consagrance amount has occa done in Germany during the same intrival (and transmitted to the outside world through the good offices of Danish astronomers) Ewin astronomics of France and Belgium driven from their observatories and their homes by the fury of in-

vasion have (when unable to take up arms in defense of their country) found asylum in Lighand or America and continued to carry on researches of the most excitent quality. But the matter of which we may well speak more particularly this month is the work of a neutral, and probably the most distinguished of all astronomers in neutral countries- Professor Kapteyn of Groningen in Holland

In a series of admirable papers pul-lished in the Astrophysical Journal this master of stellar astronomy has discussed, with great fullness and ingenity the stars of the folium type which are situated in the part of the heavens that includes the constellations of Cams Major michides the constellations of Cams Major and Orion. He has determined their datance, their true brightness and their motions in space. This problem was more difficult in this case than in that of the stars in Centiculus and Scopio which he handled some years ago for this time he had to deal with a group of stars which are moving almost straight away from use and these for assert to be watered as the star of th therefore appear to be standing almost still in the sky

The more obvious methods applicable to a group of stars with casely recognizable proper motion were therefore not at his disposal and it was only by a very ingen ious combination of all the available data that Professor Kapteyn finally reached his goal Complete success has at last crowned his efforts and at the end of his monograph ho gives a table of his results which amounts brightness of each of more than a hundred The bulk of these stars are likely to be of interest mainly to the technic

student but the conclusions regarding the distances and so on of the brighter ones are certainly of general significance and may well be retailed here

Some Startling Figures

The group under consideration includes all the conspicuous stars of Orion except the ruddy Betelguese together with almost all those of Canis Major except Sirius It has long been realized that these stars were remote and very brilliant objects but the actual figures are decidedly impressive. Beginning in the northern part of Orion, and picking out the bright stars, we find that Gruma Orionis (in the grant's shoulder, as he is that critima Orionis (in the famile shoulder, as he is depicted on the old star map. is at a distance of 370 light years and gives out about 2 100 times as much light as the Sun.—I he neighboring star I simbda Orionis in further off (\$50 light years) and though not very conspicuous to the eye is in reality 500 times brighter

The three stars of the belt are still more distant Into three stars of the bort are Mill more unstant. With many others in the vicinity, they belong to an unmistakable cluster of very white and hot stars which conters itself upon the Grant Nebula of Orion, and is therefore called by Kaptevn the "Nebula Group." The average distance of the group, and doubtless of the

Nebula itself is 600 light years. Even those stars of the cluster which appear faint to the naked eye are great suns. Thur bigma Orionis (close to Zeta and below it) is 800 times as bright as the Sun. Eta Orionis (below and to the times as bright as the bulk 21s Orionis (between and to take (left of Delta), gives out 1,000 times the Sun's light, and lota Orionis, just below the Nebulis, is 2,200 times as bright as the Sun. The three stars of the belt are brighter still, Delta being 3,000 times the Sun's luminosity, Zuta nearly 4,000, and Epsilon, the middle one of the three, reaching the prodigious brilliancy of 6,000 times that of the Sun

Kappa Orionis, in the lower part of the constellation, is 520 light years away, and 2,000 times as bright as the Sun Beta Cams Majoris, which to the eye seems so small compared with its neighbor Sirius, is 450 light years -more than 50 times the distance of Sirius 2,400 times as bright as the Sun, or 100 times more luminous than Sirius, which owes its preëminence in our skies purely to the accident of proximity

same purroy to the accident of proximity
There are several very pright stars in the group below
Sirius, the brightest, Epsilon Canis Majoris, being
nearly 600 light years away and 5,600 times as bright
as the Sun
But the leader of all this starry host is
Rigel, which just as it appears brightest to us, is so in

At 9 o clock Feb 6 At 8% o clock Feb 14 At 10 o clock Jan 7 At 10 o clock Jan 14 At 10 o clock Jan 29

At 914 o'clock Jan 29 NIGHT SKY: JANUARY AND FEBRUARY

reality The estimated distance of this enormous star is 420 hight years, and the resulting figure for its immossity is 1,000 times the brightness of the Sun Iha makes it by far the brightness star of which we have definite knowledge—Epsilon Oronis and Epsilon Canis Majoris coming next, and then Antares, which is about 5,500 times a brightness that in the heaven, but to say that Rigel is the brightness star in the heaven, but in the say that Rigel is the brightness star in the heaven, but

Simply when the origin are too suit. By inawes out one many only that it has not yet been possible to determine the distance, and hence the brightness, of any brighter star. Alpha Cygin may be as bright, or brighter, and it is rather probable that Canopus is brighter still, while some of the Cepheid variables of unswaight long perod, seconding to Singley's work, may also belong in this class. Singley's work, may also belong in this class. Singley's work, may also belong in this class. Singley are considered to the control of the control of

The physical conditions which prevail in such a re-markable object encourage lively speculation. From the spectrum of the star, which is of the type called B8, and indicates a surface temperature a little higher than that of Sirus, but not nearly as hot as the stars in the belt—from this it may be estimated that Rigid gives out brehaps 20 times as much light par square into as does the Sun. If this is true its surface must be some 600 times as great as that of the Sun, and its diameter about 25 times that of the Sun, or a little more than twantly million miles. This would make it bulk about 16,000 times as large as the Sun. What its meas may be we can only roughly juese, but according to the latest investi-gations, its great brightness would undoate an unusually great mass. One hindred times the Sun s mass might not be an unreasonable figure. This would make its times the departy of ordinary as: belt-from this it may be estimated that Rigel gives out times the density of ordinary air

Though these figures are professedly little more than

Though these figures are professedly little more than guesses, they probably give a fair ides of the nature of this amazing object—a huge ball of gas, fairly dones at the center, but highly rarefield at the edge, and furnously incandescent, even to its very outer limit, to a degree which we can hardly conceive. In front of such a star, and viewed by eyes capable of bearing its brightness, our Yun, so dassing to us, would appear like a small black spot

The Heavens

Orion, with the glorious stars of which

Ornon, with the glorious stars of which we have just spoken, a mor full south, high in the heavens, and dasplayed in has full effugence. Cama Major is below, with Siruss apparently far outshaming the vaster. Cama Miner is on the left of Ornon, and Cennin is above. Lee is well up in the East—Satur being close to his brightest star, Regulus, so that the two look to the naked eye almost like a double star—and Hydra nees in the southeast. Uras Major Livas Minor are below the Pole, water than the cephing and Cassiopera are descending in the northwest. the northwest

the northwest
Pegasus has just set, but Andromeda
and Aries are still well up in the west
Persons is higher, then Auriga, right over head Taurus is very high in the south-west, with Eridanus and Cotus below

The Planets

Mercury is a morning star all through snuary, but is best visible in the early Mercury is a morning hear as through January, but is best visible in the early part of the month, about the time of his greatest elongation, which occurs on the 7th, when he rises about 540 A M Though 23 degrees from the Sun, he is all most as far south of the equator, and as consequently ill-placed for our observation

consequency in-placed for our observation.

Venus is an evening star, and is slowly coming into view in the twilight. By the end of the month she sets at 6 30 P. M., and is conspicuous just after dark.

Mars is complexious just after dark
Mars is an evening star in Capricornus
and Aquarus, setting at 7 P M, in the
middle of the month He appears as a reddish star of the
second magnitude, and is brighter than any fixed star in

Jupiter is in Gemini, and is visible all night long, being

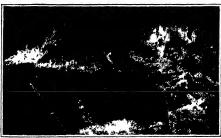
Jupiter is in Gemmi, and is visible all night long, being no opposition to the Bun on the might of January ist. Re is a splendid object, twice as bright as Sirius Saturn is in Leo and rises at about 8.40 P M at the beginning of the month. At this time he is about 2.40 edgrees northwest of the bright star Requius, which he much surpasses in brilliancy. During the month he much surpasses in brilliancy. During the month he moves about 1.14 degrees farther west, and by its close he rises at 6.30 P M.

Uranus as nevening star. On the 22d he was a second of the contract of

he mess at 0 30 P. M. Uranus as a evening star. On the 22d, he is in conjunction with Mars, being 22 degrees north of the latter Neptune is in Cancer, and comes to opposition on the 28th, but is observable only with telescoper and The Moon in new at 0.4 M on the 2d, in her first quarter at 6 A M. on the 9th, full at 4 A M. on the 18th, in her inst quarter at 1 P. M on the 23d, and new again at 6 P M on the 31st. 8 he is nearest the Earth on the 11th, and farthest sway on the 23d. She masses near Venus on the 2d, Mars on the 4th, Ulmanis on the 5th, in planties on the 18th, Neptune on the 18th, Seturn on the 18th, and Marcury on the 30th.



A skeleton from the fossil mine



The tar pit in which (alifornia's extinct fauna is recorded

California's Fossil Mine

CALIFORNIA is indeed a land of wonders and Not the least of its sights though by extremes Not the least of its sights though by no means the best known is the asphaltum bid are miles west of the heart of Los Angeles where for count unesses of the same that the same that the same have been preserved the bones of thousands of animals, most of them prehistoric in their origin Various names have been given to these beds—the la Brea Beds, the Fossil Gardens the Hancock Brea Deposits the Dash Trap, the Pit the Bone India and have a desembled. half a dozen others

half a dosen others

The deposits are by no means of recent discovery
they have in fact been known for over a centur. The
seriest record found a that of the Mission failtness who
writing in 1700, stake that the tare most for while the
settlers of the region imployed it for rooting for fuel
and for paving and in Los Angeles the roots of some of
the first adobe houses were covered with the asphaltum
brought from La Brea springs. At various times during
this period boness were reported to have been found but
it was supposed that these were only those of the racols
tilt agreed bones were reported to have been found but
it was supposed that these were only those of the racols
that the first deposition in 1867s.

animals, in fact this was the opinion of no less an authority than the State Goologiu in 1805.

When the holders of the trile under the original Spanial grants sold the property to American interests it is interesting to learn that the curous little tar springs appearing at various places on the ranch were considered. injurious to the property. It was not then dreamed that the whole region was rich in petroleum or that sourcely a mile to the north were to be located some of

searcely a mile to the north wert to be located some of the richest of prospects of all time. After the Civil Was the demand for tar row and soon carloads were dug from these beds and sold but so many bones were found mixed with the tar that the market for it cased. The big hole laft by the digging soon filled with water and tar and oil and a lake was formed Gas bubbles can always be seen breaking on the sur face of this lake

As early as 1875 the deposits were recognised as prehistoric, and a selection of bones identified as those of an extinct species of tiger. But it was not until 1908 that the work of excavation began. In June of that year Mrs. Erskine M. Ross, then owner of the ranch gave the Southern California Academy of Sciences the privilege of axcavating fossils. From that time on, several schools and scientific foundations were accorded similar privileges for a certain number of months. Many of the fossils were placed in the museum at Exposition Park 11 Los

where they are on public exhi-

Angeles where they are on public exhibition. This bones as ding out are invariably in an excellent state of preservation, the oil having penetrated them thoroughly. The animals that fell victims to this perpetual, silent death trap represent all geologic ages from the Pleucene down to the present time, the trapping of unwary animals is in fact going on all the time. The best authorities tell in a ther, the The bost authorities tell us that the tragedies took place somewhat after this tragedie (ashion

outpourings of the tar springs often formed pools or even streams which, as the dust and gravel carried by the prevailing dust and gravel carried by the prevaling west winds estied and became mixed with the tar, acquired all the appearance of a hard surface. Booser or facter ram would fall and collect on the top. It was then that the unwary slephant or saber-tooth signs or other or bird, seeing the water, came to drink. Not such the viction tried to leave the mirry pool did be choover him-edly to be sure the mirry pool did be choover him-edly to be surgest. The nove he than

struggled the more firmly and ald I he become until finally he was unable longer to move. In a short time he sank deeper and deeper in the soft tar until after a few days he was completely lest to sight. As this profew days he was completely list to sight. As this process has gone on for ages macy animals of every concewable description—be arts of all sales tools tigers elephants the giant shoth his process and a host of best and a maller content. elephanic the kinds atom into a pictoria and a host of birds and smaller quadruptic—cane to be incleded here almost in a solid mass of birds. As fate as the 80s colls were known to have been thus loat in the internal skunks and birds are trapped their today. In fact the pits may be said to constitute a natural mausolium



Stealing the perfume from a dish of flowers

in which is preserved a long and graphic record of the animals that have inhabited bouthern California through past age of geolgic time. So nearly do the fossils found here represent some of

the present-day African and Vantu spaces that some scientists are inclined to accept their if not as proof at least as evidence that thes continents were at one time connected with the An accan continent. Be that as it may the beds and the firstly in the mill always be of prime interest to the student of natural history paleontology or geology and s f r is cut now be s co there exists here an inexhaustille storehouse of relee of



The litted whose expe are worth more than those of the hen

Simple Perfume Making

FI W people know how easy it is to capture the frag T rance of real flowers. The first step in the plan is to secure a glass femael. The small end of this instead of opening should be drawn out to a fine point means must be adopted to maintain the funnel in an unright position. A little stand made of wooden uprights and wire is shown in the photograph. Any kinds of highly scented flowers such as 108es may be gathered. these should be in fresh condition as just after opening, the fragrance is at its best. Place these in a vase filled with water so that they will not wither. Now get some ice and crush this puto small fragments using it to fill up the glass funnel At the same time place some recep-tack under the funnel Sprinkle salt on the ice and then

anove the flowers and the funnel onto close proximity

After a while it will be seen that the musture from the
atmosphere is condensed on the outside of the funnel the
surface of which is chilled by the ic. The othereal odor surface of which is child by the rec. The otherest odor of the flowers combines with this liquid which slowly trakles down by drops into the receptacle. When a sufferent quantity is secured this may be mixed with about an equal quantity of pure alcohol. The maxture should then be placed in bottles when it will keep for an indefinite time. It this way all kinds of flower perfume may be captured with the greatest case

The Water Monitor

THE Water Mointer Varanus salester is one of the standbys of the oticens of India Ceylon and the Malay Pennsula and Islands and thereby hangs a tale You might shidder when you suddenly confronted one in the jungle. Not so the native hunting its eggs and rejoicing to get near such treasures. The Monitor is notes unite and so the native number is eggs and reporting to get non-so is to the native number of complete with a long finked tongue extending from a sheath like a snake. It is one of the largest of existing ligards reaching a length of 7 feet although its marrest relative the gigantic Australian Monitor grows from 12 to 30 feet long. The Monitor lays twenty or more relative the gigantic Austrainan automor grows from to 30 feet long. The Montor lays twenty or more white soft shelled eggs in hollow trees and in Barma these bring a much higher price than hen sogge. The Monton is well fitted for its life. It is a swift.

runner able to overtake the specifiest mammals frogs turtles and snakes on which it feeds. It often startles hunter six reading through the jungle making as much none as large game. It chinds trees for squirrels birds and that e.g.s. At other times it may be found digging along stream larks for the eggs of the crossodile of which

it is nost fond. I other in ranging or swimming it can leave its cutmics far behind. If surprised when up a tree it drops into the water, swimming with pe werful strokes of its flat-tened tail which acts as oars and rudder When being, captured it fights with teeth, claws and tail

The natives term the Monitor Kabara-Although it is harmless and non Goys Although it is narmiess and non-poisonous it is used to produce deadly poisons. The Sinhalese are experts in brewing a deadly poison termed. Asbara-tel. They extract poisons from venemous snakes adding arsens and other drugs, and her the Monitor comes in as a part of their superstition. They tan three monitors on three sides facing the fire I hen they torment the Monitors with whips and make them hiss to cause the fire to blaze up You and I would take a believe that the hiss of the Monitors adds to the poisonous quality of the deadly

Inventions New and Interesting

A Department Devoted to Proneer Work in the Arts

Adjustable (utter for Making Large Holes in Metal

Till tim required tocat a hole 11, to anches the left are or steer plate is fallammer I II hisel In official cuttrast is the use of a pully designed cutter which its maker say



For a quick hole in a sheet of metal

can do the same task in five minutes a can do the same task in two initiates a most valuable saving of a workman a time like cutter is small and casily transported for work away from the shop and is adaptable not only for the metals other metals slate maniating fiber asbestos board linoleum auto bodies boilers tanks and cabinets

The cutter is adjustable for making holes of various sizes All that is neces sary is to drill a 3 f-inch pilot hole through the material through which the stud of the cutter is passed and held in position by a flange nut. A few operations of the ratchet wrench quickly moves the cutting tool around the circumference of a circle of the desired diameter and a nest hole results in a few minutes

Device for Handling Hot Metal

AN American company has recently perfected a unique inquid metal car for use in charging large steel furnaces with hot blast furna c motal. In the modern processes of making steel it is now customary in the largest plants to put hot metal in open hearth furnaces together with cold scrap steel and melt the two down and refine them into steel It is not easy to transfer this hot metal into an open hearth furnace but this new device renders the operation much

It consists of a short pour ladic with the necessary tilting mechanism and the necessary titting mechanism and a motor-diven charging spout mounted on an all steel frame. The capacity of the ladle shown is 35 tons but it can of course be built

to carry any desired capacity
After the ladle car receives its load
of liquid metal from the mixer blast of liquid metal from the mixer blast furnace or a larger ladle it is taken to the charging floor of the open hearth plant by a loromotive or most reduven truck and run on a track directly in front of the furnace The motor-driven charging spout is ladle tilted the power for this being supplied by a motor and train of gears driving the drum which takes ing bar connecting with the tilting lug of the ladle

Short-pour stands mounted on the car frame enable the ladle to rotate maintaining the axis of the pour on a line with the pouring spout of the ladle. In this way, it is pointed out the pouring quart is kept close to the reacting range during the whole pouring μ it too thus centuing the metal to a shut Irop into the trough while the p rtable charging spout and ladle crane

A Simple and Efficient Pyrometer

N the early days of the war in England, so great was the demand for steel and men and women had in many cases note and women had in many cases to be used in foundry operations which ould be done successfully and accurately only by the use of pyrometers So complicated are many of these material ments and so difficult to make in a hurry that it was found necessary to devise a that would meet all the cocutial conditions Recognizing these facts two Englishmen W.R. Barchev and G. I. M. Stone worked out an instrument of decidedly novel design to meet the reourcus nts

The apparatus onsists essentially of The apparatus onesists essentially or an outer tube of fused side a closed at its lower end and open above. Inside this tube is a rod the lower portion of which is made of fused silica and the upper portion of metal. The top of this rod is pivotally connected to a point r having



at a scal beyond that to fit into

the lower end of the tube, but with the necessary allowance for expansion is a small piece of fusible metal of the same alloy as the metal for which the apparatus is to be used but w constituents proportioned so the

Drilling Upside Down

Whills not an absolute innovation the design of
the drill pictured herewith,
which drills upward natead of
downward is at least to be
recognized as daring if it
were simply one of those things
that will work and for which
no more positive claim than this
could be made at would be incould be made it would be in-teresting but such is far from being the case, and it therefore acquires added interest from the numerous advantages which its manufacturers bring forward

as the main features of their epositest edge of the tube and terminating It was designed, in the first place, is a practical metal worker, for the purpo of chewing up tons of old castings in h



A novel inverted drill that feeds

own shop, but it was so successful that the more finished model illustrated was the more finished model illustrated was brought out for commercial development. The drill upward principle is claimed to effect a 50 per east increase in the speed of operation, since the borning in the drill to work in Audit from this, perhaps the best thing about the drill to work in Audit which is adjustable as well as automatic in a word, but the discount arm at the top of the machine sets, under the pash of the weights decreased to the drill of the discount arm at the top of the machine sets, under the pash of the weights of the discount art out, and severe has that forced at the word of the machine sets, under the pash of the weights of the discount art out, as a lever has that forced at the word of the machine sets, under the pash of the weights of the discount are the discount of the machine sets, under the pash of the weights of the discount of the discount of the machine sets of the discount of the disc seen at its lower end, as a lever har that forces the work down over he drull. All that the operator has then to do is see that the work is properly placed, so he can operate from ax to eight spundles without difficulty. In this connection, another valuable feature at he spring cushion at the top of the spindle, which takes up the blow when the drull breaks takes up the blow when the drill breaks through, and thus saves much drill

breakage
This gang drill as intended for use on
cast-ron, steel and brass articles which
can be put through at the rate of 7,000
to 10,000 pleces per day
As a "speedup agency in the machine shop its makers unset that it is hard to best

An effective liaison between the blast furnace and the

gaps (i) or (2) are filled automs ally f r the passage of a train in one direction or the other

How the rails are laid out for the



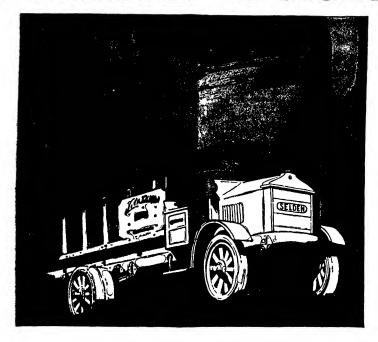
The jeitless cressing, showing the ings and the mechanism that operates them

A Shockless Railroad Cress

A SHOCKLESS railroad crossing A SHOCKLESS railroad crossing A sHOCKLESS railroad crossing anothe on a branch use for swread months on a branch use of the Southern Pacific in Los Angeles It is so devised that the opening at each of the four free points of the crossing is avoided, thereby doing away with the pounding or jumping of the wheeless. of the wheels

At each of the four points fo At each of the four points formed by two nuterescenting lines of tracel, instead of the old style frog all laid in one piece, only the two outset in our discount of the property of the prope

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建設企業

18

FOR GIFTS

Patronies Flowers not only delight the eye, but their governoon forth. beauty and fragrance brighten the atmosphere. Four hoof for it within a few hours on deliver from hoover in may sty or team to the united festing and domainst through the Patricks traignated policious persign.

THE MIDGET SLIDE RULE





Where Nothing Goes to Waste (Continued from page 8)

operation and which proved most effective in the method of patching There are em ployed here 341 persons principally women The harness department repairs all the old pieces of harness brought in from the battlefields after being sorted out the French harness is returned to the French army and the British harness to the British army The chief items are complete sets of harness of which about 1 000 ar turned out weekly and saddles representing about 700 weekly Some 150 women and 50 men are employed in this work and the value of the monthly production amounts to \$215 453 In the canvas department are handled leggings haversacks canteen covers cartridge belts. medical packs waist belts and other small equipment articles and it turns out daily 000 canvas articles and about one carload of burlap sucks Its production in a month equals about \$222 878 in value

The total output for the month of August was over three million dollars (53 246 888) while the cost of production was \$315 0.13 the percentage of cost as a suppared to the value of output was 10½ per cent. The satual salvaging operations of the depots started last January with five officers axy enlasted men and ax cevitian employes while at present about 10 000 persons are employed. The results show that the plant is not only saving a large volume of transport but over \$100 000 per day and while the coming of peace curtained the operations of the plant in all metal lines there is little occasion as yet, for it to shrings its observations of the plant in all metal lines there is little occasion as yet, for it to shrings its other activities.

Our Giant Aircraft (ontinued from page 7)

ideal landing places for scaplanes and

Bying it late

10 s v that the N C 1 is the largest

10 s v that the N C 1 is the largest

the late of the world is to overlook, what

the late of the late of the late of the late of the

construct N Caproni is kniwn to be hard

at work in gant triplance one of which is

said to excred ever tone in lifting capacity. The

Cormans during the past year developed their Goths I isens long-distance

bomber with a wing spread of 140 feet

and a lifting capacity of jerhaps five tone

and a lifting capacity of jerhaps five tone

with four piverful ongues. The lifting

have developed a still larger Handley Page

bomber with far instead of two capins

with has already carried more than 40

passengers in re cit tosts

All the late beligsrents are now at work

All the late beligerents are now at work on large planes because they realise that only the viry large planes have a real commer all value. The purrent or chase planes—angle-seaters capable of developing high spuds—have little or no commer all value. The two seater reconnais sate 1 general utility multary planes are available for mail carrying and light express serve. But the gaint planes can be used for passenger transportation and for his ling express are large.

speed a essential surraft constructors are inding the renergies toward large airraft and it may be a matter of only a f w m this before passenger-ourrying planes are ready for busness in this coun try an i abroad and the Atlante will have been bridged by some form of heavier than-

Iron That Can Be Whittled

12 as well known that sajid cooling of hot metals hardens them. That the opposit is true has recently been demonstrated in attituing fashion by the Glenzal Electric Co. One of their scientists annealed American ingot tron surrounded by hydrogen gas for three hours at a temperature above 1,600° F. The product was very little harder than the softest copper and can be whitted with

LATHES AND SMALL TOOLS

The "BARNES" Positive Food
Upright Drills
10 to 80-back Swing
Sand for Bull Condeyer

And In Bull Condeyer

laby Street Rockford, Clina





THE Ro. \$1 UNIVERSAL WOOD TORKER is the mast was 20 to the weight suchear real layer and the real layer and







THE BRIDGEPORT CHAIN CO. Specialists in Smell Wire Slapes & Field Stampings Bridgeport, Comm.



EXPERT Model and Experimental Work
PAYENTIONS DEVELOPED TO COMPLETION
REX RANGEACTRING OD, Inc., 1928 Breakey, R.Y. C.

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Four Engineering **Money Makers**

Four hig fields with unlimited money making opportunities are open to you fiy on will use a little of your pare time and prepare yourself.

The best way to do this a to make use and prepare you had to be the same of well known engineers and experts have written them in plant overy-day English just to help ambitious the same of the same of the same same one of the same same same one it time-

dissaids of other men have don deare doing it every day You o ke us preve how these books w she us preve how these books will help ra more by indicating on the compan w you want for PREE EXAMINATION all it today See the free granulation

Electrical Engineering angineering

Applementary Child Congineering Congineering

Machine Shop Practice

FREE A WEEK'S



A Simple and Efficient Pyrometer (Continued from page 18)

melting point corresponds to the tempera-

with a special covering to resist the cutting in its allow the rod to descend, by gravity until In so descending it raises the pointer in the quadrant to the position shown in the dotted lines, thus indicating in a positive for pouring The pyrometer is then withdrawn from the crucible and in order to prevent its metal charge fro solidifying round the rod the outer end of soliditying round the rod the outer ond of the pointer is depressed until it is forced by a spring catch into a recess in the bridge-piect hitting the rod clear of the metal When the latter has set it is merely necessary to release the pointer the apparatus is again ready for

It may be noted that a special socket connection has been devised to join the metal and the silica portions of the rod in order to prevent the latter from becoming separated when the metal socket expands with the high temperature. The connection consists of a socket having a number of slanting sew cuts formed in the sides. The silica rod is fitted into the contral recess and rammed in with comen the arrangement being such that the saw cuts allow for expansion without relaxing the hold on the succa rod In the event of an accident, such as the bottom of the tube falling out while in the crucible, the charge is not spoiled as the fusible metal being the same class of alloy as the charge does not have any deleterious effect on it

A Shockiess Railroad Crossing (Continued from page 16)

every case leaving a gap in the rail tops be tween the and of the inner section and the

purpose there is a lug or filler at a data of the eight gaps, so arranged as to take by threders of good stock. Poultrymen either of two positions—up, filling the gap in particular use much selling literature in the rail, or down, leaving the gap un Trademarks and trademarks are employed gilled. These eight lugs are connected more and more by these man better with each other by the operation machine. ism, which can be set up to operate in

ther of three ways

In any event, there is a base casting,
the rails rest On each side of

This automatic system is of course sixty which was undoubtedly worth hundred as all feasible for fast trains, so for mathematic with the was undoubtedly worth hundred like up-special great the growing. Under this and business-getting name for the products greaten have consigned to some and the greatent great

center of this bar is fastened a three-armed device and a straight bar the ends of which correspond with the short lugs on which the upright lugs are neeling point corresponds to the tempera-ture at which the metal in the cruebble attached strong lups connect the short should be poured. The silics rod rests lupon this piece of metal and when so resting the pointer is in the zero position of the cruebble and the rest of the r when the time has arrived for ascertain entering the other lugs are, down Attaining whether the metal is ready for pouring the pyrometer is lowered into the crutche of motion metal. It may be here explained the critic and carried to a keyr at any common that it is necessarily to the critic and carried to a keyr at any common that it is necessarily to the critic and carried to a keyr at any common the other lugs are, down Attaining the critic and carried to a keyr at any common the other lugs are, down Attaining the critic and carried to a keyr at any common the other lugs are, down Attaining the critic and carried to a keyr at any common the other lugs are, down Attaining the critical common that the critical carried to a keyr at any common the other lugs are, down Attaining the critical carried to the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common that carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a keyr at any common the critical carried to a key of motion metal. It may be nere explained a recent of motion to when operated out that it is necessary to cost the portion of set flugs or fillers nees while the other the whole subset which enters the crumbly dryps. Operate it may be wholly auto-with a special covering to resist the cutting in its because the regular. with aspecial covering to resist the cutting and by the regular action of the slag and the reaction of the space of the state of the space in me dire tion or the other

When desired the rossing can be opit I I trically instead of mechanically this purp see the ordinary mech us I far merating switches from the Hock system may be employed using selenoid palls to move the lags inta position

m Farm Trademarks that Bring Business

ALWAYS a trademark is worth having, and when it is catchy and particularly appropriate for the products sold it is of especial value. To this remark the business of agricultural production affords no exception An eastern farin famous for its poultry and which has extensive apple or hards adopted an attractive distinctive name that combined these two products in a single coined word which was illustrated cartoonwise by an appropriate design. This mark in varied sizes is employed wherever opportunity permits on letterheads en volopes billheads selling literature carton It is a striking thing that is seldom forgotten by those who see it long ago

Progressive farmers who long ago realized the value of a good farm name are now adopting trademarks freely where the farm advertises or sells direct to the consumer by parcel post the money making possibilitie of the device are making possibilities of the device are so great that puns should be taken with it () med names like that alluded to have particular value for while a poorly coined name simply sounds silly, a good one has enormous pulling power and it offers the additional advantage that it can be registered in Washington and ownership and sole right of use thus guaranteed The head of one of the great biscuit comtween the and of the nuner section and the land sole right of use thus guaranteed intersection of the outer rails. Thes, The had of one of th great busult cominserted rails are marked in the diagram pantees a ward to have appraised the content and the three a line of contractions. The dear of the device as to provide at train on either line, as familiar with animally advertised at the approach of a train on either line, as which only the origination and advertising as done purpose there is a ling or filler at each of the contraction of the second stake. For this use

f the registry privilege, the cost of which is so trifling Sometimes deplorable con-sequences arise

In any event, there is a base casting, exponents the rails rest. On each side of this, a few makes from the bottom, is a like eads of each shaft are found the lugs or make the eads of each shaft are found the lugs or make the first system all the lugs are stock and has fared, able there is a full rail in each direction, all the time. The flarge of the the first system all the lugs are stock and has fared, the later an enterprise whale, as it meets the lugs opponent its pessage, pushes them forward, after each whole has passed they return to their formulat the rail surface for the wise—a scorediagly be traversed without an exposure of the state of



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re justed (14203) W. R. S. asks. As you unlout teelty are aware the advantages that
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(11294) F It P says Could you kindly ive me any information is converting garbage ito fiel I think you prilished something note first. I think you jit likeled membring respectively the point measure women time ago if you have an shink on this probal by you could pay me the point of the probability of the point of the poin of heat in the furnace preventation of leakage of cold air late the furners high pressure brown draught pressure brown draught by utilization of the best generated. Such a furnace is called a Destructor. When it is desired to millize the heat generated by the burnting return the waster gasses are passed through high pressure helies installed in the setting between the furnace and the chilmony. The amount of evaporation and the chilmony. The amount of evaporation of heat in the furnace preventation of leakage of hollers instaled in the setting powers in the furnish and the chimney. The amount of evaporation in the boiler naturally dipends on the character of the refuse and other variables. In common practice about 11's pounds of steam at 100 pounds pressure can be generated per pound of refuse hurned. This often runs up to 3 or 4 pounds evaporation. The commercial value of gan-bage as fuel is illustrated by the Destructor at lear as fuel is illustrated by the Destructor at Westmount P. Q where the high receaser setant generated by utilities the waste heat from huming refuel as I amon proportion of the steam used in the sunskipal electric light plant. The present Destructor at Othern generate and the plant proposed to the present propose in the new Destructor at Twenton turning the contractor of the plant in the contractor of the plant in the contractor of the plant in the contractor of the present in the plant in the pl

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(14296) W O asks The primitive lated as extrain 6 pth. On mks. The primitive man lived an out-door life constantly in close contact with Nature h. slept on leaves or radioly improvised beds. All animals practically do the same the does and in fact, nearly all animals, if inddeponed unusity seek the damp cool earth to curri up and leap-spec skilly if they are inclined to be feverish. We are told that the heart to a least the same and th be feverals. We are told that the heart to a certain extent generate intervity A an man became more elvillated and adopted elvillated colonial states of the second and adopted elvillated colonial state of the second and another than the another than the second and the second and another than mentated that I for his initiate to insomals he mentated that I for his initiate to insomals he mentated that I for his initiate to insomals he initiated that the second heart to the main create additional frictional cite trially in the nates. I he shought come to me that an overplus of state might elvilate the are can extent. I know state migne irritate the nervous system. I know of some persons who have attached a wire to the water pipe with a handlo iteld in the hand for awhile before going to siecy. They claim the current flows from the earth establishing an equilibrium in the system I claim that unlost the supposed benefits derived are imaginary the static flows from the body to the earth. there are instrument insolve the carrier is there are instrument made sensitive enough to record such current or has any investigation to your knowledge been made along this line or could sufficient statk be generated in the system as afore described to affect the nervous system or profuse resultaneous or is tha affect of the grounded wire merely imaginary? A We have no preconciled opinion upon the subject of your inter and about online affect need subject of the profuse of the profuse of the profuse that the body generates electric by in the proce-tiata the body generates electric by in the process of its vitial activity. It may or may not do so We are certainly inclined to the losslet that any loss of the profuse of the profuse of the pro-side troops are the profuse of the profuse effect by a discharge of a static charge in the body due to function from tytus on a bod. The due to function from tytus on a bod. The limit of the profuse of the profuse of the profuse interest of the profuse of the profuse of the profuse with the success of the works of the black that

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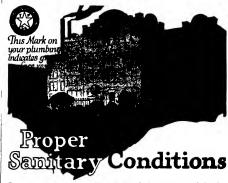
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Getting Down to Business

Today American Business faces an era of stupendous possibilities. We are shout or enter an age of industrial prose the war has tapped cannot be sealed up. They are known open and flowing and must continue to flow for the basels of all mankind. This is an obligation arising from the unquestioned Leadership in Finance Transport stems Industry and Agriculture which this fortunesed was have thrust upon America.

O every thinking man the future must be interpreted largely in terms of motor transportation

New industries born of war's necessity must continue to serve in peace. They will need motor trucks

The enlarged capacity of America's factories none too great to meet our own and the world's requirements must rely upon modern haulage

Our standardized fabricated ships are needed to carry America s goods to foreign lands Their cargoes must go down to the sea in motor trucks

The multiplied harvests of our power operated farms can best be carried to market with motor trucks aiding rail road and ship

Our soil is still rich with coal ores and petroleum. Better roads and more trucks are needed to release them We accept Federal s part in this great constructive peace period not only as an opportunity but as a duty

That manufacturer falls short who sees in a motor truck only a power vehicle to be sold at a profit

He must sense his larger obligation to supply haulage units that will assist in the fulfillment of America's great in dustrial destiny

ROM thevery beginning of its history Federal has laid solid foundations

Federal significations a mere combination of specifications but perform ance quality of service—the assurance of haulage reliable efficient and economical

What Federal signified before the war Federals have proved many times over in their war time record That record is the ample evidence of what may be expected of Federal in the coming period of business expansion

Federal plans for the future are plans for growth in order to answer every haulage need for more trucks and the right kind of trucks

The Federal Haulage Research De partment will be developed still further so as to offer motor truck users inform ation that will enable them to get the utmost of service from their trucks

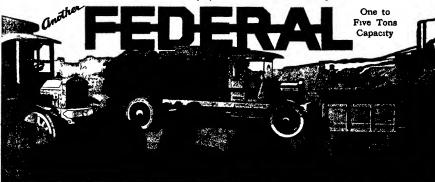
This is the purpose that animates the entire Federal organization as we are once more 'getting down to business'

If in the following out of this purpose, Federal can help you in your business, you may rest assured that no details will be overlooked in our endeavor to serve you well

For the benefit of motor truck users present and prospective Federal publishes regularly an attenst in worth while imagazine. Federal Traffic News which discusses actual problem so I haulade in various specific lines of business and shows how they have bean solved. It contains a wealth of suggestion on motor transportation for the owner and operator of a tuck. We will be pleased to send it to business executives on request

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THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX

NEW YORK, JANUARY 11 1919

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Ratiroad Ferry Service Between England and France

ONE of the carefully-guarded secrets of the war was the construction at Ruchborough, on the south coast of England of a large fright yard and railway ter-minal ferry for the transfer of loaded trains between England and France So well was the location concealed that this important link in the cross-C hannel com munications was never sub-jected to bembardment by

jected to bembardment by airplanes or Zeppelins. The terminal which is known as Ruchborough is lossted near the coastal town of Sandwich, and was built upon land which, three winters ago, was a favorite resort of the coot and the heron, and was used, in part, or the pasturing of sheep

for the pasturing of aheop One.

The site selected included about 2,200 areas, and in addition to a large railway storage and classification yard with the usual tracks and storage yard with the usual tracks and storage buildings, there was constructed an ex-tensive plant for the construction of barges. The magnitude of the Rich-borough terminal works may be judged from the fact that at the close of the war its personnel included 20,000 officers and

For the train ferry service three steel terries were constructed of the type shown in our illustration. These vessels are 33d feet long by 61 feet in beam with 10 feet of draft, and their speed is 12 knots. Their displacement is 3,055 tons and they are draven by twin screws. They are provided with four railroad tracks running the length of the shap whole have expanded on commodate the rise and fall of the tules movable ferry slaps were provided at each terminal. The trains were run directly on the ferry and at the terminals at France were hauled ashore and taken directly on the ferry and at the terminals at France were hauled ashore and taken directly on the ferry and the terminals at France were hauled ashore and taken directly as the same to be shown in the ferries were not loaded with freight transfer to the significant of the ferry that the training supplies for the fighting front. The service was started in full same on the lat of February, 1917, and from that time to the signing of the armatine, it had carried serves 1,285,000 tons, gua shelit into the signing of the armatine, it had carried serves 1,285,000 tons, guar and the state of the fighthey are plant. A large number of barges were shortened here and, in canasculou with the farry service, a total of 233 steel barges and 500 tags were in community opening the order of Perses, which enclosed digit into the fighting fraction. ferries were constructed of the type shown in our illustration. These vessels are 363



One of the railroad ferry-boats, built for cross-Channel war service Carries 54 cars at 12 knots



The ferry-alip at Bickborough being lowered to level of ferry deck



and ferry leaded with

It should be mentioned that each of the ferry boats carried four anti-submarine guns of three inch caliber two mounted at each end of the boat In addition to other terminal on the English side of the Channel at South ampton lerries from Rich borough ran to Calais and Dunkirk and the service from Southhampton ran to Dieppe

The Effect of Altitude on the Eye

ACAREFUL study of the effect of altitude on the eye was made at the Re eye was made at the Re search Laboratory at Mine ola, L I in order that the complex practical problems could be more scientifically dealt with according to (apt

de all with according to 6 apt
Conrad Berons M C US A
writing in Plant N us Sight
accommodation (the power
to see clearly objects close
to the eye) convergence (the power to keep
the gase of both eyes fixed on an approaching object) the best of viscos (power to
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the convergence of the power to build, deeph and
the fixed to be the convergence of the power to build, deeph
and the fixed to be the power to build, deeph and stereopsis (the power to judge depth and distance) all showed weakening due to the

datamic) all showed weakening due to the effect of altitude the changes occurring at varying altitudes in different subjects Should goggles be worst. In our opin ion continues (apt Berens they undoubtedly should be worn if a properly constructed and ventilated goggle with a perfect hild of vision and gord optical glass can be obtained. Goggles art a great protection in the wind as their use prevents tearing and inflammation of the hids and also prevents hot water or oil from striking

It is also important that there should be not too large a bar between the eyes as this may interfere with the use of both eyes in the judging of distance Colored lenses are a great help but it is better to wear them only when absolutely necessary as when flying toward the sun in a fog above the water or in the case of pilots whose colored knses are worn one should always have a pure of goggies with white lenses ready for instant us. Friplex goggies are some protection although chips of glasse fly off the posterior surface and the rensiting material placed between the two glass surfaces deteriorates with age and becomes less transparent

If a man is flying every day without the If a man is fiving every day without the artificial use of oxygen is should have his eyes examined every month, as the ocular condition is also an index of general physical fitness. It is important to have an immediate ocular examination if the aviator is landing badly having trouble in seeing clearly or in judging distance, for a few days' treatment may be the invarian of preventing the wrecking of a plane or a more serious secident

SCIENTIFIC AMERICAN

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The bject of this jurnal is to record accurately and lucidly the litest scientife me hinscal and is fustrial news of the day. As a weekly jurnal it is in a post announce interesting developments lef re they are published claes here

The Felster is glid t have submitted to him timely articles suitable for these columns especially when such articles are accompanied by photographs

New York Subways Must Be Readjusted

"HI new system of subways including two fundamental lines extending north and south through Manhattan and the Bronx om on the West Side and the other on the Fast Side with a system of shuttle trains supposed to connect the two at 42d Street, has been in operation for a sufficient length of time for the traveling public to form an estimate of its convenience and efficiency

We feel confident that we are voicing the practically unanimous opinion of the people of New York in which we heartily concur when we state that the present arrangements are exceedingly inconvenient

A passenger coming down from the upper West Side who wishes to cross over to the lower I ast Side line or vice-versa has to alight from the train at Times Square follow a long and confusing course through the station to the shuttle tenue and on arriving at the old (craud Central Station he has to climb the stairs and take another long walk before he can get into touch with the East Side line. Even to the passenger who has made the trip and is familiar with it the delay and the con gested crowds are from a business point of view a nussance and incur a very considerable loss of time In other words a truly magnificent system of rapid transit is delayed interrupted and to any but regular users, that is to say to many many thousands of visitors to the city is rendered extremely confusing

In considering this problem we must not be unjust it cannot be denied that in the neighborhood of 42d btreet there is a great congestion of underground lines and beyond question the Public Service Com mission and its engineers had a very difficult problem to work out at this point. But seeing that they had determined upon a shuttle service they should have made it a sine qua non that the shuttle-train tracks at each end of 42d Street terminate alongside the platforms upon which the cross-over passengers are discharged

Something must be done to restore the system to its full efficiency. The obvious plan is to build another connecting subway through one of the cross-town streets in the neighborhood of 42d Street using the present 42d Street line for the trains which convey passenger from the upper West Side to the lower Fast Side and using the other cross town subway for traffic from the upper East Side to the lower West Side Such an ar rangement would restore all the greatly appreciated advantages of the old system and would avoid the present troublesome break in the journey

HEN war was declared the technical men of this country who were unable to men of front demanded some means whereby they could share in the prosecution of our cause l his feeling resulted in the organisation of the War Com-mittee of Lechnical Societies. The functions of this tody were to assist in bringing the engineering resources of the country to bear upon the technical problems of

The Committee was organised by joint action of the leading technical societies. The appropriations from these societies were too small to support efficient work so the Committee accepted an offer from the Navai Consulting Board by which it agreed to cooperate with the Board in return for offices, tell ubone service, and postal privileges

the first fruits of this admirable arrangement wer omt bullctins of the Board and the Committee on The Firmy Submarine and Problems of Airplane improvement. These bulletins placed before the Improvement engineers of the country in concrete form the funda mentals of these two important fields of war invention They told what had been done what had been tried without success what was wanted they risulted in a much improved class of suggestions over what the Board theretofore been receiving

But it was not contemplated that the engineering problems of the war be dealt with entirely by voluntary offerings of the pulls. During the prosecution of hostilities new problems of all kinds were constantly coming up both in the army and in the navy These were problems which the army and navy engineers by of their very specialization were not qualified to atta k to best advantage and on the other hand there seemed no effective agency to exist whereby such publicms might be referred to the men equipped to solve them It appeared therefore that the War Committee with its technical affiliations could meet a very real need by acting as a go between to bring the problems of the army and the navy officially before the anguerra and techniques best qualified to deal with them

At first there was a hitch in this arrangement There was no go between to bring the problems of the army and the navy before the Committee and the latter found it difficult to get hold of these problems at long range This situation was met by quartering the Committee with the navy and by appointing in the army a liaison officer part of whose business was the keeping open of communication between the Committee and military chiefs

All this turned out admirably The problems of army and navy began to get properly before the Committee in all their bearings, and the Committee was invariably able to analyse them sufficiently to refer them to just the right place for solution Some were suitable for general distribution to all members of the engineering community through bulletins and letters some of a some confidential nature went only to selected individuals who were known to be interested in the class of work in volved and a certain few secret to the last degree required the higest order of technical qualifications to be found only in earefully selected scientists and inven tors whose whole life-work had fitted them for the investigation in hand Its success in the handling of these ast cases alone would have been sufficient justification for the life of the Committee

Of course the Committee did not operate without friction It had to learn how to discharge its functions by discharging them and learning from its mistakes made plenty of these but seldom or never the same one And it was just getting into its stride, and bringing the whole weight of our technical mansquarely into the fight, when the bottom fell out of the war and left the Committee without a job

This little notice is in fact an obstuary On December 31st the War Committee of Technical Societies ceased to exist. It had done its work well it was responsible even more than can be adequately realised from so close by for the thoroughgoing participation in the war of American invention and engineering. And though its members may have feelings of regret that what must appeal to them as the untimely collapse of the foe should have robbed them of the satisfaction to be derived from witnessing the full fruition of their labors, the Committee at least goes out of business with the satisfaction of having done all that was asked of it-and a little more

Getting Rid of German Shackles

N the floud of lamentable nonsense that has been let loose of late in the American press on the subject of German science and German scientific literature A. of German scence and German scenario chusetts Institute of Technology Writing in Session on the subject of Insidious Scientific Control, Professor Wilson hits the nail squarely on the head when

he undertakes to point out just in what way the scientific literature of Germany as superior to that of other countries and the direction in which the rest of the scientific world must bend its efforts if it would secure freedom from (erman intellectual shackles

So far us the public at large is concerned, the issue has been deplorably confused by resterated statements to the effect that Germany has never surpassed, or perhaps has never equaled certain other countries in the task of adding to the world a stocks of valuable knowledge In the field of creative science, we are told, German grant this contention with alacrity What then?

The policeman on his beat the cab-driver on his

box and the provinceal politician on his stump may be pardoned for believing that a nation which is not prolific in scientists of the first rank is not capable of turning out particularly valuable scientific textbooks and refer ence books Nobody who uses such books however, should fall a prey to this fallacy The best didactive scientific books are almost never written by the leaders in scientific thought and the pioneers in scientific investigation They are written by persons who have a talent for exposition and unflagging industry in assembling knowledge wherever available, and who, as often as not, have never made a single scientific discovery

Just how have German publications acquired their undenuable held upon the minds of well-educated scientific workers throughout the world? It is idle to talk of propaganda The modern business man is well aware of the narrow limitations of advertising that does not rest upon merit in the goods advertised and propaganda is merely another name for advertising

Professor Wilson has supplied a partial answer to the feregoing question. It is found in the everyday law of competition He says

The fact is that any scientist must have the means himself readily to look up the literature on any scientific subject and the fact is that the great compendiums of science the great yearly reviews of scientific progress, are made by Germans and published in the German language It is impossible for a mathematician to work to advantage without being able to consult the Jahrbuch für Mathematik It is impossible for physicists to work without consulting the Fortschritte der Physik Science Abstracts are not sufficient And so it is in many other fields of science

Every cosmopolitan scientific mail will be able to make nany additions to this list | The Minerva Jahrbuch is the one and only first-rate international directory of scientists and scholars. The Geographen Kulender is indispensable within the field of geography and contiguous sciences No British of French atlas approaches Stieler's in workmanship and accuracy But the list m endless

The business of making scientific discoveries is one thing, the business of recording them summarising them. rendering knowledge of them available is quite another In this latter field Germany has had no serious rival and at the present writing no other nation mansfests any sersous intention of taking her place

The workings of competition will not long be hampered by sentimental considerations Unless non-Germans can produce as good dyes and drugs, textbooks and reference books, as those made in Germany, we shall inevitably lapse into economic and intellectual subjection to the Germans It will not help the situation to harp upon irrelevancies

German monopolies have not been good for the world at large nor, indeed, for Germany herself Her commercial monopolies have been shattered by the war Whether they can ever be reastablished is problematical The particular kinds of intellectual monopoly of which we are writing can only be said to be in abeyance hear that British and American manufacturers have solved the dye problem and the glass problem. We do not hear that any publisher has produced an American equivalent of Stieler a Hand-Atlas 'or a British equivalent of Winkelmann's "Handbuch"

These are excellent reasons why books indispensable to students and scholars should be printed in English rather then in German

Electricity

Why Not Larger Trolley Wheels?—In the Electric Reliesy Journal some account as given of the experience of the Oakland, Antoch and Eastern Railway with 10moh trolley-wheels Formerly 8-inch wheels were used the trolley pole tenson being 35 to 40 pounds, and the life under these circumstances was only about 900 miles By using 10-inch wheels the tension can be reduced to 25 to 30 pounds and a life of 0,000 miles or more is obtained. In addition, various incidental maintenance troubles are disminished

Naval Control of Wireless—The Navy Department has purchased all of the radio stations except four high-power stations of the Marconi Wireless Telegraph (Company of America, The stations sold by the company are 45 in number of which 10 are on the Atlantic and Guif coasts 16 on the Great Lakes and 10 on the Pactific Coast. The Navy Department has purchased from the Atlantic Property Custodian the radio station at Sayville I. I, formerly controlled by German interests and imtended for transatlantic wireless traffic.

Marconi's Improved Radio Transmitter—The apparatus developed by G Marconi for the production of continuous oscillations by overlapping wave trains has proved most effective for long-distance communication at high pose? It has done sava with many of the intreste mechanical and electrical prollems encountered in the construction of radio-frequents afternations and art transmitter systems according to the Exterioid World Moreover it makes an apparatus capable of generating damped oscillations at any spark frequency design.

Dielectric Loss in Condensors—In a contribution to the Zatschrift des Guster Ingeneur and Arch skinn I arense Dr Grunberg describes some tests on glass hard paper and muca condensors at a low frequency with glass the efficiency diminishes with increasing frequency A rise in temperature also causes a marked increase in the Gosses, which increase rather more rapidly than the square of the pressure applied With hard paper a more marked drop in power factor occurs with diminishing frequency than in the case of glass, while with most the contrary effect is noted.

Wind Driven Dynamos - in account was recently given in Jegenore by Mr II C. Vogi of some expenence of the utilisation of vind power for driving dynamos. Ib mills described had sails 100 feet in diameter and an area of 3 840 aquars feet. With a mean wind velouty of 24 feet per second 290 horse-power was obtained. Power is transmitted from the main slaft by a seria of goog wheels with the apokes in tension rope and chain gearing were found not to answer. It means of gearing the speed of the main shaft 121, revolutions per minute as increased to 1500 revolutions per minute for the

Electric Heater for Medicinal Solutions - In warning solutions for modicinal purposes it is often essential that an even temperature be maintained according to Alectrice il World With this end in view an American concern is now making an electric heater which incloses the tubing carrying the solution from the supply to the point of apphenion so that as the solution is needed it is heated to an even temperature By using a light dimming socket in conjunction with the heater it is possible to lower or raise the emperature of the solution by varying the amount of current fed to the heater Connecting plugs and cord are supplied with the heater

Insulator Failures —A power company operating in the State of Georgia has recently changed over all the strain maniators on one of its lines as a means of reducing mathator failures. Operating reports of the company showed that 30 per cent of the insulators wave defective. The cause of the large number of defective maniators was found to be on account of the combined influence of the sitematics, the position of the madiators was dual that design. Unequal expansion and contraction of metal parts, of porealin and centent, played a part in the failure, but the child classes was due to the insulators being installed in a horizontal position, their under under the contraction of the contractio

Science

In Honor of Leonarde de Vinci — Ihe fourth centeary of the death of I connarde de Vinci will be celebrated next year in Italy by the publication of a national edition of his works including material never before published Leonarde was the greatest executifie and mechanical genus of his torie and those executifie and mechanical genus of his torie and those place in all ingress centifies and echinical biraries of the works will doubtless find a place in all ingress centifies and echinical biraries.

Fake Cures for Consumption According to the National Association for the Nuty and Prevention of Tuberculosis no less than \$20,000,000 is invested in the humaness of making and exploiting fake cures for consumption in this country. About \$5,000,000 per annum is spent in advertising these nostrums and the typic facilities of the profit is estimated at \$10,000,000 per annum. This is properly described by the Association as blood money

Sengite -- Under this name which is derived from the initial letters of the words Substitute explosive no glycerine with ite added in imitation of the word dynamite a new explosive is being manufactured in South Africa to inect the grawing shortage of nitroglycerme explosives According to a consular report it has a guncotton base and is similar to tonite except that nitrate of soda is substituted for nitrate of barium. It is found that by this substitution an explosive of approximately the same strength as gelignite can be The new explosive is said to be so insensitive produced to shock that it may be safely hammered with a steel tool If used in mining explosions would not be caused by drilling into unfired holes It has already been thoroughly tested in a number of mines and found satisfactory

Adenaid Clubs -- Under this paine the state hunrd of health of North Carolina in its flealth Bulletin describes a new plan whereby surgical treatment is provided at moderate cost t children suffering with diseased tonsile excessive a len 11 growth and kindred disorders. In the medical inspe tion of schools many cases of this kind are constintly found Simply to notify the parents proves woefilly malequate ewing to the expense of an operation the necessity in many cases of taking the child away from home and a general spirit of mertia. The new scheme which has been tried with much success in vari us parts of the state since 1914 involves engaging the services of an expert operator who visits a particular locality on a day previously announced bringins, complete equipment and a trained nurse and operates in as many as 15 children in the course of the day. A (comorary hispital is installed at a local hotel and local physicians are engaged to look after the patants until they come round properly By this plan the expense to the parents able to pay for the operation is reduced to \$12 50 per child and children of poor parents pay nothing

Fixing the Responsibility for Diphtheria Fatalities -The State I aboratory of Hygicine of North Carolina has recently undertaken the distribution of diphtheria antitoxin practically free of cost to the people of the state. The charge f i a package of antitoxin irrespective of its size whether it contains 1 000 units or 10 000 is 25 cents which is march to cover the value of the accompanying syrings and wrippinge. At the same time the state board of health has adopted the policy of seeking to fix the responsibility in cases f death from this preventable disease. It is proposed at the outset to make a carry il investigation by persons visit of a trained epidemologist in one hundred cases of death from diphtheria in various parts of the state With very few exceptions children die from this disease because antitoxin is not promptly administered in proper amounts Less than two per cent die if thus treated during the first two days. Responsibility for the the fatal cases may be either with (1) parents who delay summoning a physicain when suspicious symptoms present themselves, or with (2) physicians who fail to administer antitoxin promptly to patients and persons exposed to the disease and not shown by the Shick test to be immune, or with (3) the local health officer for failing to see that a supply of antitoxin is at all times available in his vicinity. The state board of health proposes to publish hereafter in its monthly Health Bulleten details of fatal cases and to point out so far as possible, just who was responsible in each case

Industrial Efficiency

A New Dutch Industry A factory has recently been installed in Holland for the manufacture of sacking carpots, and even lime fatheres from plant libres, by occase of a new process. Creat quantities of vegetable fiber is now being accumulated for the purpose.

Hemp Braid Dye. Here I for the malbits of the Japanese to dive. succeedible here I rared which is exported to the I intro States and I ingland for trime ingono women shats has set of mile the vession according to business being done in this articl. However, a report has been received from Jupino the effect that in Japanese chemist has invented a process whereby the dyeing may be done unformly.

Steel Band as a Substitute for leather Bilt. I be searcy of feather brought his art by the was bas made it necessary to find a st istitut for that material particularly in the case of letting. At the Leven inne in the letting web the case of letting. At the Leven inne in the letting used to replace it leather main driving ledt 52 feets mine on length and 7 nucleo in breadth. The width of the band is orly sinches and the code are joured by means of other least state of the band was hour \$450. Though from some under ever cause this bind gave was near the joint the nume sufforties in view of the joint the nume videorities in view of the joint of the nume videorities in view of the joint of the nume videorities in view of the joint of the nume videorities in view of the joint of the mine videorities in view of the joint of the mine videorities in view of the joint of the mine videorities in view of the joint of the mine videorities in view of the joint of the mine videorities in view of the joint of the mine videorities in view of the joint of the mine videorities in view of the joint of the mine videorities in view of the joint of the viewer more.

Numerous Jobs for Cripples A recent canvage undertaken by officials of the Lord Motor Company plant at Detroit for the purpose of ascortaining how much of the work at that point could be handled by empples revealed the following interesting information John that could be filled by legless men 670 by one legged men 2637 by one-armed men 715 hy totally blind men 10. The time required for cripples to become expert at these piles is estimated for 1743 one day or less for 1 461 one day to one week for 251 one to two weeks for 534 one month to one year for 43 one to About 18 per cent of all the employees at the Ford plant at the present time are said to be cripples or physically substandard | 1 ighty-five per cent of them however are classed as fully efficient workers

I emon Drops for Our Army - When our draft armies first came into truining it was found that the lemon drop was a favorite candy among the men It was found also that most of the commercial lemon drops were made of glucose flavored not with the fruit but with an acid imitation. The military authorities obtained samples of kmon drops from a ractically all the candy makers in the country analysed these chose the best one obtained the formula for its manufacture and distributed orders for a supply of lemon drops to be made according to the accepted recipe Consequently the soldiers are now being supplied with a lemon drop that is made of pure granulated sugar and flavored with an emulsion from the rind of the lemon. This confection has the thirst-quenching quality of good lemonade And it is being used by the soldiers at the rate of 200 000 pounds a month

The Danger of Empty Gasoline Tanks -Seemingly empty gasoline tanks or cans are at all times inorc dangerous than those filled with gasoline Usually the ean will not be entirely emptied and the remaining gasoline will vaporize the vapor will mix with the air in the can and the mixture may easily be explosive When the can is being filled this mixture is forced out by the gasoline and may explode if ignited by a flame or spark near the opening Many engines are built with cavities or inclosed spaces in the crank case base or some other part and these may be full of gasoline When inspecting or making repairs with an VADORS open light men have been severely burned when the light vapors ignited. To guard against such accidents all cavities should be blown out with compressed air or steam If neither is available the cover should be removed, the valors fanned out and a lighted lamp or candle, attached to a stick passed around inside the cavities to burn out any vapors that may remain in the cavities Unless an ample current of air at considerable velocity is passing, gasoline should not be used to clean an engine or other machinery Lven if there is sufficient air to sweep away the vapors as soon as they are given off open lights should always be kept a safe distance and on the intake side so that the vapor cannot be carried to the light

Cibola Revealed

Relics of Coronado's Seven Cities in a New York Museum

By John Walker Harrington

CILNCF and r mance give attest to the Seven Cities of Cibela with Kingdom of Quivara of which the good Frier told while sitting in the baters while the good from the district of the district of the control that the whole and it is used to be sure and the kinghts who faced across the American desert have long amene gone to their fathers as to the great of toronado himself his good sword is routed this many a year. We have a first strict this many a year. We have a first strict the first permanent in the first permanent that the first permanent is a first permanent the surface and the first permanent for the district permanent for the first perma

and yet after all what a name is Cibola with which No v that the Covernment has no more need

conjurt. Now that the constraints has a withholding from practual uses the bronz and steel and glass from which showcases are made the Museum of the Amerian Indian in New York city will be able to hisplay the riches of Chola to the public Scorces of heavy packing cases laden with thom are already waiting in the hisement and perhaps soon we shall have the chance to see the relies of that venerable town stormed in 1540 by the Spanish conjuctors

Wherefore let the archaelogist and the historian rejoice together over this notable nistorian rejoict together over this notatine collection from which they may learn so much and let the layman also be glad that he may see for himself what Don I rancisco de Coronado and his followers got for all their privations and their pains.
The riches of Astecs and the Incas

which came so easily into the treasure chests of Spain filled the adventurers of the early sixteenth century with the belief that all the New World was running over with treasure more precious than the wealth of Ormused and of Ind When it was proposed to explore the realm to the sued with the Spanish court for the privilege and they fought each other in the tribunals The more they quarreled about the lands still unseen the more were they convinced that gold and silver and precious stones could be had for the taking

Under the direction of Viceroy Mendosa you will recall the intrepid Coronado set forth from Compo stella in February 1540 to annex the Province of Cibola and the kingdom of Quivara Strange high sounding and the kingdom of Quivara Strange high sounding names were these—given to what is now the Southwest of these United States They were based on the language of the Indians and gradually so many were the tales which the aborganes had told the Spaniards came to believe all that their awartee decisted concerning the mysterious settli ments beyond the border Irue, they had sent as a secul, the good Friar Marcoa de Nua, who,

Zuni Indian workmen employed in resurrecting the relics of their ances

friar came upon calmer days, and was under the ministra triar cashe upon camer akw, and was under the uniners attent of the kinght of the rasor he undoubtedly fold no more than was aurrounded by walls with guarded gates, where there were goldsamths and alivermiths where the women had golden beads and the mon girdles of gold. and where there were sheep from the fleece of whi

and where there were sheep from the fleece or which were wever garments of pure whit, and where the people slaughtered birds and also had images of iron. The story of the march of Coronado loses none of its interest nor does it dwindle in its importance through the discovery of the document among the Spanish

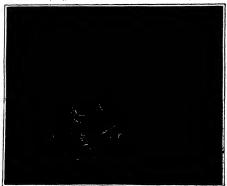
Archives which shows that, five years earlier, Cabe de Vaca had traveled the old Santa Fe trail in the que of the tolden West Coronado will always be asso-tiated as the real pioneer, with these early chapters times as the real pioneer, with turse early chapters of the history of the Southwest for undoubtedly the effects of his expedition the most extensive ever made within the borders of the United States, have been far-

With 300 picked men the most of them cuessed in armor and carrying their great lances in rest, and attended by hundreds of burden bearers, the army It discarded or sent back many of its heavy

trappings and superfluous baggage, and trappings and experiment baggage, and it was reduced to the lightest possible marching order when, in the heat of August, it reached the first city of the quest Indeed, when the natives resisted the design of the when the natives resisted the deesgn of the conquerors to take everything in sight, a sorry and feeble brigade it was which attacked them The invaders were nearly famished The cross-bowmen and the harquebusers were so weak that they could hardly move, and the arms of many of them were out of commussion The mea of Hawikuh, fighting from the house tops of the wall town three bones with such accuracy that they overwhelmed many of the exhausted Spaniards Coronado, a conspicuous target by reason of his shining gilded armor was twice knocked down and would have been killed had he not down and would have been killed had he not been dragged away by one of his andse Fhe natives finally surrendered, however, and the adventurers occupied the town Once in the houses they found abundant food which satisfied thom so well, that for days they were gladder to have had it than silver and gold The town was abandoned entirely by the Indiana, who went to newhorms satisfemants and left.

abandoned entirely by the Indiana, who went to neighboring settlements and left the Spaniards in control to the Spaniards in control on which he had set his beart, Cornando and he and divinous of his party penetrated as far as the present neighborhood of Kannas This was years before Plymouth Rock and Jamestown, and through the first, who afterwards established chains of unissons, critisation was established in what is now the rich and populous American West

populous American West
There is abundant confirmation of all that Corenade Incre is abundant confirmation of all tast Coresaed and his accompanying historians said about Hawkith, which so closely resembles the present pueblo of Zuni Tbs treasure trove of science which the museum has been shie to unearth through the generasity of one of the trustees Mr Harmon W Headricks, tells us truly







A hunter, surrounded in his grave by deer's antiers, traphics of his province, and with the customery broken bewi at his head

all that the cities of Cibola were or hoped to be. Here an test the cute in Choice which still contain the remains of orn such as that from which were made the cakes, which the famished conquistadores said were "the best that ever they did est"

ever they did eat."

The excavations have been for the most part along the slopes of refuse where the dead were bursed. Some of the bodies and been cremented and placed in uras, alongsade of which were the charred grains and foods made roady for the spirits of the dead. Here is a mighty hinter, a Nimred of the Messes, with whom were bursed author of the deser that he had aliam, in the hope that in the Happy Huntung Ground he might still have good score.

Sport The good friar was not wont to complain grievously of his dark gude, Estevanico, who exacted tribute of turquoises, and won the hearts of many native women, And here we have, driven tripit to the skull of one of the feminine eachantresses of old, a comb of wood, encrusted with the blue gen and bearing a band of jet. The wanties which filled that once shapely head are no more, but here in the ruins of the venerable village, we have but here in the runs of the venerable village, we have plenty of proof that the women of the day wors many adornments and were proud of their gaudy garbs. They were found surrounded by their jewels, such as they had, and the vessels of graceful form which they had with them in life. Many of the best examples of pottery were shattered as they were thrown muto the graves—purposely sacrificed or "filled". There are some samples, almost prefect when exhumed, in which are holes in bees and lid to show that they had been offerings to the masses gritted years and the same place of the second place of the s

previous expedition under the auspices of the American Bureau of Lthnology and the Museum of the American Indian. Specimens of baskstry, matting, cloth stones, cord, objects of wood, stone and bone, thousands in all, contribute to our knowledge of the ancient city and its

It is believed that some of the remains are those of Indians who preceded the people who lived there when Coronado came in quest of plunder. That is a matter over which the archaeologists may study for many a day over which the archaeologists may study for many a day to come by comparing and assentialing the pottery fragments—a work now being conducted by F W Hodge, sessited by George II Pepper, who spent last summer amid the excavations of the runned pueblo. There will be oergedal interest in interpreting the de-

signs which appear on many of the objects Especially promising are three bowls with the macaw, the goldfine and the paw of a bear, with a pendant feather attached by a string Another bowl bears the figure of a dancer

When the entire collection is prepared when the entire consection is prepared for exhibition in relation to the surround-ings of this present age, we shall find much which will appeal to all of us in the time-worn remains of New Granads as Coroworn remains of New Granada as Coro-nado was wont to call this first of the Sevan Gatles They of Chola lived in cham-bered and terraced dwellings four and five stories high, strongly built of stone and adobe, the original apartment houses of this country, the prototypes of those structures which we latter-day Americans inhabit. The Cholans brought no bound-less wealth to the concursor, and set in inhabit The Cibolans brought no bound-less wealth to the conqueror, and yet in what a mighty city of riches and power have the bones of those who dwelt in that mysterious realm of old come to rest!

Water Tanks of Concrete Staves

Water Tamins of Concrete Staves
THE accompanying illustrations show
The construction of concrete stave
tants developed at Maria, Texas These
tants are used widely on the ranches of
that vicinity Until a little more than
three years ago the concrete stave was not
connducted adaptable to the comstruction
of large starage tanks, some of the leading

considered Ringhadow to the contesting of large storage lanks, some of the leading side builders having the 16 out theroughly also builders having the 16 out theroughly. The drawning shows the details by means of which the concertos stave has been made a practicable device in this connection. The floor is other-creased with expansion loints, which are partly filled with tar or asphalik. It will be seen that the staves for the tank walls are of five patterns—linely and short top claves, long and short bottom stewars, and the full or regular between 18 things proper combination of the contesting the start of the contesting the con



Jar containing cremated human remains covered with a broken howl

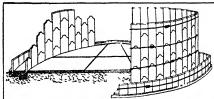
around the outer base of the tank and the steel hoops with expansion joints provide the finishing touch

The Current Supplement

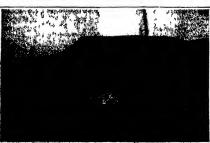
T is fully recognised that the molecule plays a dominating part in every branch of physics chemistry and many other departments of secure. In a paper on Molecular Orientations in Physics and Crystallography



A small tank of concrete staves



The details of construction of the Texas concrete stave tank



Concrete store tanks of \$75,000 gallens especky

in the current issue of the Scientific American Sur Plement, No 2245 for January 11 some of the problems relating to the molecule are reviewed from a new and interesting standpoint. A second instalment of the articles on The Macoa Indians of Venezula appears in photographs The Pharmacology of Al ohol, which treats of this important liquid in relation to its action as a drug will be of interest in the times of dry movements Steel for Reconstruction calls attention to the enormous mands that will be made on the United States for this demands that will be linde on the Contest states for this modispensable material of which America is the largest product in the world. The note is accompanied by a number of instructive photographs. Curious Projectiles describes a number of shalls and bombs invented in describes a number of statis and combin streetly in Germany and Austra that appear to be more ingenious than practiced. It is illustrated by a number of diagrams Auplane Accedents is a careful discussion of an important subject from a medical point of view by a British sur-geon based on personal observations. Other articles of interest in this issue are The Principles of Diffusion and Their Analogues, The Rat Pest, Sewage Disposal by Dilution The Slory of a Grass A New Photographic Mordant Dye Process and The Theory of Fertilizers

Making Old Iron Bridges Stronger

Making Old Iron Bridges Stronger

A bingenous method of strengthening old cast iron
A bindges has been devised by a British major the
county surveyor of shropshire. The fundamental idea
is to encase the original arch ribs in ferro-concrete, thus
making good defecter resulting from cracks and general
deterioration and rendering the studenters capable of
somplying with moder in traffic require in airs.
The first bridge treated in this manner was a cast iron
structure built sity years good you home. Tellored rise
returned to the structure of the control of the cast iron
structure of the years of the structure of the control
defended on the man read between Shreesbury and Luddow, had
long been unift for heavy traffic and in the course of a
careful examination made last year it was found that two
of the cast iron ribs had developed cracks of serious of the cast iron ribs had developed cracks of scrious character at the haunches. On the recommendation of character at the haunches On the recommendation of the major, the county authorities decided that the two defective ribs should be enemed in ferro-concrete, and the work was successfully carried out on the Mouchel Henneluque system No disturbance of the road surface or handraling was involved, the forro-concrete work being executed from platforms suppended below the two outer cast iron ribs. The appearance of the listorie structure has undergone no appreciable change, and bridge is bridge a now very much stronger than at the time of its

The county surveyor has arranged to strengthen

in a smiler manner a second cast iron bridge, built by Telford exactly a hundred years ago on the main road between Shrewsbury and Wenlock

British Steam-Power Economies

FOUR HUNDRED experts have been appointed by the coal controller of Great Britain to consult with and advise steam power users how to eliminate waste As the result of an inquiry by the Coal Control Technical Department it is clear that tremendous wastage of coal is going on which could be prevented it will however, take several years to recover the whole of this loss, even if a supreme effort is made by all the industrial firms, as it was impossible to install more efficient plant while the war was on Another cause of wastage of coal is the employment of unskilled stokers, and, unfortunately, th are today perhaps more men of this description than at any other time, as so many skilled stokers have joined the

There are 45,000 users of steam plant in Great Britain Up to the present reports on 364 firms have been carefully scrutinised, and it is estimated that a saving of approximately 106,000 tons will result This saving can be effected without any serious alteration to plant in the following directions

1 Obtaining greater efficiency in the com-

1 Obtaming greater efficiency in the combustion of fuel 2 Educating of stokers 3 Utilizing the heat in the gases to better advantage 4 Using orthurst steam for heating feed water 5 Adjusting engines more efficiently to use the steam generated 5 Using the but water from the condenser of the control of the

Wartime Agriculture in Great Britain

The Administrative Machinery and the Means Adopted to Secure Land for Tilling

By Major H. Bannerman-Phillips

Title question of the lost simply of the United Ling don in view of the posed with 5 of war with a nation possessing great naval recours a had of course been consistered before the war and the divisibility of national grunness discusse 1 but in thing was done about the lift r and no measures were taken in practime to incourage, agreeditur. If was realized that supplies it must am wheat from abroard would have to be de-"HE question of the f to I supply of the United King must and when from abroad would have to be de-pended on for a very large proportion of the food of the people and though the average margin of reserves within the country was only sufficient for from air wicks to three months consumption there was justified could leave in the ability of the Navy to protect the sea-bone traffice of the British impire. But when Turkey entered the war and Russian wheat could no longer b reckoned on when harvests all over the world gave a reduced yield when tonnage was increasingly required for other things besides food when the submarine menace became serious it was realised by the Govern ment that the supply of meat and wheat from neutral countries would have to be more and more supplemented by home grown supplies

Putting the Farmer on a Firmer Footing

The poor harvest of 1916, with the low condition to which stocks of cercals had fallen made it evident that the problem of the feed supply of the United Kingdom would become acut in 1917 Other factors also seriously would become acute in 1917 Other factors also seriously affected the situation in 1915, partly in response to direct appeal, there had been an increase of 430,000 acres in the area of wheat and 280,000 acres in oats, acros in the area of wheat and 280,000 acres in oats, though this was to a large extent offset by a decrease of 350,000 acres in barley and 75 000 acres in other cereal crops, there had also been a slight increase in the area of potatoes. In 1916, on the other hand the area of wheat had fallen back by about 280,000 acres, while the yield of the crop had been considerably below the average, and, owing to the increasing shortage of labor, the out look for 1917 was serious. It was estimated at the close of 1916 that the area sown with winter wheat was 15 per cent less than in the preceding year. Further the potato crop for 1916 had proved to be one of the worst postato crop for 1916 had proved to be one of the worst on record, and the shortage; in the very important article of food was already making itself felt. The Cabinet, therefore, decided immediately that vigorous action must be taken to secur, if possible, an increased area under creads and potatoes in 1917, and to provide for a program in 1918 which would under the nation to a greater degree self-supporting in respect of cread food-stuffs, of which normally 60 per cent is imported in dealing with the situation, the first essential vas

to strengthen and confirm the confidence of the farmer.

The experience of the agricultural depression in the eighties and minetics, which had led to the heavy decline. eighties and mindits, which had led to the heavy decline in the tillage area, inside farmors heatsto to undertake the breaking up of land. There was on the one hand the growing startity of labor and the rise in costs of production, and on the other hand there was the natural production, and on the other hand there was the natural fear that sooner or later cereal prices might come tumbling It was therefore necessary, if a considerable tillage area was to be secured in 1917 and in the subsequent years, to give the farmers artificial security With this object in view the Cabinet, in December, 1916 decided that prices for wheat, cats and potatoes in 1917 should be guaranteed to the farmer, the same guarantees applying to all parts of the United Kingdom. This program was subsequently more fully developed in the Corn Production Bill with a view to laying down a policy which would make the country more secure, not only in 1918, but in the succeeding years. As in the case of munitions, so in the case of food it was felt necessary to ensure against the risks of a prolonged war. This act, by securing to the farmer minimum prices for wheat and oats for a period of five years, by providing a minimum wage for the agricultural laborer, and by securing powers of entry upon land and requirement of better cultivaere this was found to be desirable in the national interest, laid the foundations of the new policy and

The Machinery of Agricultural Expa

The principles of this policy having been announced, the Board of Agriculture for England and Wales, the Board of Agriculture for Scotland and the Irah Depart-ment of Agriculture and Technical Instruction set to ment of Agriculture and retended instruction set work to reorganise and extend the machinery for assisting farmers in the task of carrying out the program of moreased tillage. It was necessary to develop both local and central machinary, but with the extended program it became more important than over to provide for

it beame more important than ever to provide for greater decentralisation.

Accordingly one of the first steps taken was to set up in every country in Great Britain small War Agricultural Executive Committees of not more than seven members appointed by the War Agricultural Committee of the Country, together with such additional members as the Board of Agriculture might appoint in Ireland the sust-ing statutory Country Council Committees on Agricul-ture were available for the campaign With certain reservations the accuracy of the special more of the Executive, Committees of their preservative more These trusted to the Board of Agriculture was conformed on three Executive. Committees in that reportive areas. These Committees have appointed spread where Committees to deal with e trans branches of their work was he had been dealered to their work was he had been dealered to ecountry, a Datent committee and the act as an advasors body to the Executive Committee and in many countries parant presentatives committee and in many countries parant presentatives in lound with each parath in the country. The Central is lound with each parath in the country. The Central the Committee and the Spread was a special who are exigling members of the Spread was considered and the Committee of the Presented Committees, and who act as inks between the Central Department and the Committee Leach Executive Committees has its own proper staff. between the Central Department and the Committee Local Executive Committee has its own proper staff and in many counties considerable assessment has been their officers at the disposal of the Luceture Committees, while, throughout the country valuable help has also been received from the staff of the Land Valuation Department and the Inland Revenue The County Agrendutural Executive Committees report to the Central Department on the stake and progress of cultivation in their counters and frame estimates as to the possible areas of increased outlivation. They are also charged with the work of preparing estimates of requirements of labor, machinery, fertilizers, seeds etc. and the successful carrying out of the extended program is in great measure. due to the voluntary and hearty cooperation given by members of these committees

members of these commuttees. Alone to increase the At the same time steps were timent to order to deal with the new situation. The President of the Board of Agreeduate for England and Wales appointed an Advisory Commuttee on Food Production and a spicial Bood Production Department wars established in fauntry, 1917, in Scotland and also in It land special Advancy Commutes to the Central Department serve appointed

Getting the Land

The first problem was to form an estimate as to the additional area which could be brought under tillage in the spring of 1917. A rapid survey was made in February and March for this purpose and on the basic of the reports rendered it was estimated that in England and Wales an additional area of 300 000 acres, and Scotland of 50,000 acres, might be secured. Under the Defence of the Realm Regulations the Boards of Agriculture for England and Wales and for Scotland had be given powers to enforce cultivation where they con-sidered that the land was not being properly tilled, and these powers, with certain exceptions, have been delegated to the County Agricultural Executive Com-mittees Acting under these orders, the Committees mittees acting under loces orders, the Committees can serve notice on occupiers r quirng them to cultivate their land in such a manner as the Committees think necessary or, where no improvement takes place as a result of warning, the Committee may take possession of the whole or a part of the farm and either cultivate it or let it to new tenants.

of the whole or a part of the farm and enner cutavase or let it to new tenants.

The Committees report their proceedings each week to the Department, and the pleture they give of the agricultural conditions of their countes shows that large parts of trust England had such into a vertical slough of despond. Case after ones was reported of considerable areas of land which, having at one turn produced good areas of land which, having at one turn produced good careas of land which, having as the port, allowed to bocome derelied or fared in the pure sport, allowed to bocome derelied or fared in the pure sport, allowed to bocome derelied or fared in the pure sport, allowed to bocome derelied or fared in the pure sport, allowed to bocome derelied or fared in the production of the land for their Prisilipood, and for whom there is no excuse on the ground of lack of the necessary capital in other cases, however, farmers had been allowed to obtain possession of far more land than they were able to cultivate adequately with the capital at their disposal, and in some parts of the country there are large areas when formerly supported a considerable population, where the houses and buildings had been allowed to fall

into ruin and the land had been used merely se an-tensive sheep or eattle ranges. Wherever pessible such places are being dealt with by the Onsaltieses, but smarp of them will require new buildings and other works on a scale impractable during the way.

scale impracticable during the war.
All powers recident in the Commisses have been exoroused, but in the main the increase in tilhage in England
and Wales and in Scotland has been obtained by voluntary appeal to farmers. In the case of the 1918 program,
however, which provides for an increase in the arable
area over 1916 of 2,700,000 acres in England and Wales and 350,000 acres in Scotland the Boards of Agriculture have allocated a quote of this amount to each County Agricultural Executive Committee, which is empowered to serve notices upon farmers in its area calling upon to provide a certain amount of additional til them to provine a see what amount of countries unage The Committees have been engaged in carrying out a detailed survey, in order to apportion their quota among different farms, to eshedule grass land which might with advantage be plowed up, to secure as in-creased area of coracia, roots and potators on the satisfing arable land, and to ascertain any land which is not oring cultivated by the present occupiers.

In Ireland a different procedure was adopted.

In Ireland a different procedure was adopted. The Department of Agriculture and Technose Instruction, by an Order in Council of January, 1917, required all agricultural, holders of over 10 acres to increase their arable area in 1917 by 10 per cent, except where a arable area in 1917 by 10 per cent, except where to arable area on any farm already amounted to 80 per cent of the total area suitable for arable cultivation with the second of the second of the second of the total centre of the second of the second of the the 1916 area, with a further five per cent increase in the second for the house of the second of the the second for the house of the second of the the second for the house of the second for the second the case of farms having 200 acres or more of arable land.

New Agriculture on Old Lands

Stops were also taken to survey areas of land where production could be improved by dramage. In almost every county there are thousands of acres which might be used for agricultural production if properly drained,

sery youn'y insize are incusated at some what magnets be used for agreembart, production if properly drained, be used for agreembart, production if properly drained, unspected and sported on, and several schemes have been upon the operation when would secure an immediate improvement in the land for tilinge purposes. In Scotland also a nurvey was made of deer forests with a view to restocking tracts of land with sheep.

A great live-took industry has been built up on the wonderful permanent grass lands of England, but the wonderful permanent of the comproving may be the usual method of plowing up the land has already secreeding, and and the properly the lands are sufficiently and the second of the possible to use the arready secreeding and for raining hay A method with this object has been devised by an England farmer and tried by him with second on a small scale during the past year It was described in the Scustivity datasets for June 29th II the plan is subjected on a large scale that year, as is now toest revised by an Joigan tarmer and tred by him with control of the Secondary flow past year. It was clearly deal to the could control of the Secondary flow past year, and the plan is adopted on a large scale that year, as is now proposed, it will mean more grann this year, more best next vinter, and more outs, wheat, hay, and grasing in 1919. If the new method is as successful over a large acreasy as it has provide to be an the experimental stags arrange as it has provide to be an the experimental stags arrange as it has provide to be an the experimental stags arrange as it has provide to the control of the stage of the control of the contr

Old Names for a New Navy

The Beroic Associations That Attach to the Names of the Famous Fighters of the Past

SCRETARY DANISLS has issued no order so sempletely popular as his reling that our five now hattle-crimers shall be designated the "Constitution," "Constitution," "Beautops," "Lastington, as the second of the constitution of Ranger "The Chief of the Navy Department has brought back to our first fighting into traditions as second as they are old of the control of th of one's country from therdeck of a "Constitution' or a "Nasgara," is to see yet keener dage to the characterstic American fighting qualities. What fine particulam would be bed from mere service on a craft selled. Constella-tion," with all her daring memories of achievement! The original visued of that name, now at Newport as a training skip, will hereafter be the "Old Constellation," years as it will laterafter be the "Old Constellation," which

even as it will hereafter be the "Old Constitution, which visitions at Botton a Navy Yard will veil and honor. There is no "Leximpton" at present on the int though hear the name. The "Saratoga, existing till 1911 as the cruiser "New York," when ahe took part in the static off Saratoga of Cuba, will now be rechristened once more and hocome the 'Rochester In the name of a nation a naval ince one may read the

an the name of a nation s navai me one may read the astion's spirit. National feelings and deals are there spinsally set forth Our own method, for instance, though at first sight backing in originality and rather pressinally methodical, keeps well to the fore the basic thought of our Federal structure. If the battle-crussers are hereafter to be assend to commemorate the mighty

historic past of which we are justly proud the dread noughts will continue to brar the names of our states and each soversign commonwealth undoubtedly has an and each sovereign commonwealth undoubtedly has as sound a right on battleship all its own as lot is own is in the blue field of the flag. Our crusers are christened in honor of our greatest cutus, our gumbonts for those of lesser use, albest often of historic eloquence (as "Yorktown and Chattanooga.") while it is reserved "Yorktown and Chattanoga) while it is reserved for the destroyers to recall distinguished nan as of naval commanders past and gone it ugh not forgotton. During the war we have had illustrated thre interest-ing instances of this last mettoned method in the

mg instances of this last invitoned method in the christening of the Radi 'id Montgomery and Kithy Few zon-awal is not tiday recall this trio of Rear Admirals, unfews it to their fellow townsizes of Finoactic Virginia Allentons New Jersky and Hagers-town, Maryland yet they we, gallant commanders all Radford was in charge of a criting out expedition during the Mencan was reasonable of the Curl Peland the Mencan War was captain of the 'cur i erland when she was sunk by the Coi offerate ram Merrimae and directed the New Irons is during the streke hard form Pinher in the Christians seek of 64 and fortinght. For Fisher in the Christians seek of 64 and fortinght is considered to the Christian of the Christian of

In this same destroyer connection it is distinctly worth in tass same destroyer connection it is distinctly worth the record that, for the first time in our history one of this class of vessels has been named for an unlisted man—and in thus honoring Clust Gunner's Mate lagram of the U S S 'Cassun Mr Daniels has at once done a grace in this Bobbring count vumners water ingram or use U S S 'Cassan Mr Daniel has at once done a grace ful thing and commemorated an heroic action. When the Cassin was torpedoud she like other destroyers had depth bombs stowed on deck aff. These were charged with a considerable weight of high explosive

and as the case of the Manly his since shown their detonation would do a deal of diningy ingrain saw the silvery wake of the Hun tripide as it sped toward the Cassin and saw also that it would strike her aft. Though he must have known that the chances against him were tremendous he took no thought of I imself ran aft and succeeded in getting the depti clarges overboard just before the torpido struck kiling him before he could get forwird. But due to his self sacrifice the Cassin was saved from were damage and he was the only vituo of the torpedo Courage is a common place in the fighting services I ut such a deed as Ingram's maintains the best traditions of the Navy

sa a common place on the fighting services 1 ut such a deed singrams manatans the best traditions of the Navy The great sea fighters of Europe indi ate (itsrify the characteristics and history of the several lands to which they belong Logiand has revorded in stick of the several lands to which they belong Logiand has revorded in stick of the several lands to when they belong Logiand has revorded in the Mariboro and Lord Nahona (crowdliss and Drake 7 h. Agmoourt has already extered the battle hine glynng with the traditions of that signal victory of the fifth Henry Around the 7 termerare highly shime recollections of Trafalgar while the Ramilles 1 fron Duke and Black Prince all speak with prophetic confort to a minitant today through English triumphs of long ago.

The academic shides of Oxford and Cambridge are The academic shides of Oxford and Cambridge are Neptine 1 uptater. Mars Thoseus Minerva Neptine 1 uptater. Mars Thoseus Minerva Dinas Juno Adradne and pretty much all the rest of Parnassus When the guns of the Agamem on spoke deeply off the Dardandlies they not only recalled the segs of Troy distant 3 000 years if only a few soor males but, also seemed to eveh the thunders of its forefather's cannon at Copunhagen So again if the Bellerophon awakans memores of winged Pagasua, much more does it recall the day when the great-great diarrance vide that much the administrative Masseromia. grandpapa of this modern marine Cerberus received, in durance vile that mighty and superlatively dangerous

Correspondence

The editors are not responsible for statements made in the correspondence column Anonymous commualestique cannot be considered, but the names of cor respondents will be withheld when so desired

The Shipping Problem

The Bhipping Problem

To the Editor of the Sonswire Assauca A

I agree with your editorial this week on any expansion, but did to occur to your what folly it is also to squander money in marchant ship expansion on the problem of th sest that these ships will be handicapped all their life has hip han proposes to build ships at four transportant cent. They have wasted millions in building about the selection would be a selected to the selection of the selec

must decline and will to 20 per cent of present rates must occure and will to 20 per cent of present rates
High freights prevent business growth and expansion
A company of which I am a Director had two 3 000-ton
Scotch built steel steamers which cost us \$150 000 each
We sold them for over \$500 000 each
No private owner can afford to face United States Compensation by the States Countries are sicel, he builds ships at United States cost You and I pay the bill Steel gris the business and profits now, the running of the ships at a loss later is another II I Undersitie. can afford to face United States competition unless war profits have paid for his slips. Mr Schwab's interests

"A Broken Idol"

To the Editor of the Scientific AMERICAN

I have just read and reread your editorial in the issue of November 28d under the above title trying hard to get at the root of what you mean There is no single get at the root of what you man. There is no single statement in what you say that I would oppose but there are underlying implications that will be used to thwart the great cause of the League of Nations whether you intended it or not

No man can be a good citizen of the world who does not thrill with pride for his own country But no man is an intelligent patriot no matter how great the sacrifico does not work for the establishment of an international system of justice that will be less haphasard than the sevolent anarchy (from our standpoint and that of our

sessives anarony (rom our sanopoint said rate our Allies), that has been proven so insufficient.

The oreston of the League of Nations is the supr me task of our generation. We can not styre in advance all the great problems of the future but the organization of the machinery of international control is our sacred duty, the neglect of which would make us slackers to

posterity

The time is ripe, and every publication, scientific and
otherwise, should rejoice to use its space to arouse men
to this great mural and spiritual mobilisation. L O McArsa

The Oil-Cooled Keresene Engine

To the Editor of the Scientific America. I consider rates the highest to express my appreciation of peur article on "Gil-cold Kenesson Engine," that appeared in the Nevember 10th Scientific America. Your exhiberitainty statement of the facts in this case in the mean visionment of applied that I have read for

quite a time. Incidentally may I add that for several years past I have been giving quite a bit of time to the study of such a development and including no small amount of simple physical experiments. Might mention that in this same assue of the SCIENTIFIC AMERICAN I was favored with a brief mention of a patent on temperature control means

control means As unnatural as it may sound to you it has been my experience to learn that even many swell known automotive engineers although devoting valuable talent to the perfection of the industry are apparently uninformed or not open to conviction as to the undeniable possibility of the great increase in fuel efficiency that is inevitable with the adoption of internal combustion engines deagnod to operate at higher temperatures. In fact statements that I have received in reply to my inquiry as to their attude along this line are so elementary and unappreciative as to become absolutely disgusting. It is my fervent prayer that more engineers of your kind shall eventually see fit to impress this fact upon the minds the state of of the masters of the engine world. I am sure that the result would be that the near future will see an evolution that will surpass any of the truly marvelous innovations that have done so much in the past

trust that this simple note of appreciation will at least tend to soothe any effect of averse criticism that your article may have brought upon your head

Anderson, Ind HARRIE & COV

The Electron Formula

To the Editor of the SCIENTIFIC AMERICAN

With reference to the electron theory of the physical and mechanical universe I would like to recall to e SCIENTIFIC AMERICAN the fact that the Alfred Nobel \$40 000 physics prize awaits the discoverer

of the electron formul

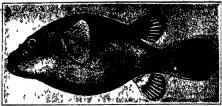
In 1906 Sir 1 1 I homson of Cambridge University In 1998 Str 1 1 Homson of Cambridge University hagland was awarded the Alfred Nobel \$40.00 physics prise for advancing the electron theory and it has been suggested that a securitie society be organised to devote its entire time researching for the electron formula. The writer would be pleased to hear from those who

believe in the electron theory when we may eventually reveal the great law of the universe through the columns of the Scientific American

ERA M V LERWAR New York, N Y



The file fish of Eastern Asiatic waters His bottom spikes enable him fairly to sit down on his victim as he stings



Weeding Out the Poisonous Fishes

How Scientists Are Tying a Figurative Bell on the Dangerous Denizens of the Deep

MR L W CUDGER Pricesor of Biology of the North Carolina state Normal School in behalf of the Carolina bestitution Washington has been engaged at the American Museum of Natural History. New York studying poisonous fishes. In Washington a section of the Bureau of Isideries under Dr. Hugh M. Smith Director is husy on similar lines In California, Dr. David Starr Joidan President of Stanford Uni versity is strenuously at work testing all kinds of fishes available. There is a universal and feverish effort going on in different institutions to test up all products of the salt and fresh waters of the world to get at of the said and from waters of the world to get at everything edible and throw into the distant everything unfit for human food. As to the latter every effort is being made to find some kind of utility for discarded species either for leather fertilizer commercial or dicinal oils etc

Possoneus fishes for convenience may be divided into those forms which are unsafe to est and the types which by their bitts are destructive to edible or useful which by their litte are destructive to orbible or useful fables and danagerous to man. There are also said little of conditions which are unastic four instance this bluefish the most popular manue food in summer will it it happens to feed upon decayed mosebunker used as chain by commercial fisherima or anglers not only make ill those who rest it but cause the face and other parts of the bunna body to brack some interest or the competitions. rash The carmivorous bluefish in the ocean which feeds ravenously on schools of mossbunkers which it follows is perfectly edible when taken by net fishermen When however the mossbunkers enter the bays to breed they stick to shallow water where they are safe from pursuit It is then that the bast beats offer seed messbunkers (or menhaden or oilfish as they are called) for the use of commercial ishermen and thousands of pleasure anglers. The need mossbunker soon decays in the heat and the bluefish that fill up with him become permeated with alkaloids which they convey to the stomachs of human. It depends upon the human stomach involved whether there is immunity or not from hah alkaloids and ptomaines

Still another source of danger to humans is the fish that have died which are sold in the markets or caught In Furope net fishermen or anglers who with a hook. In I urope not inhermon or angiers who allow fish to die in the air are prosecuted and punished to the extreme limit. All fish caught in Luropean waters must be butchered alive. Even the hook angler

catching fish for his own home consump tion, must kill each fish with a knife im mediately upon taking it from the water Government inspectors to out with fishing fleets. They require that fish must be butchered alive the same as steers and the carcasses thrown into iced holds. Only lead or frozen fish can be sold in the markets or peddled in America few such precautions are taken and hence the vast amounts of decayed and unfit fish consumed, bearing toxic alkaloids to the human stomach Hence also the vast amounts of fish rondemned by boards of health as unfit for consumption of health as unit for consumption. When an angler, for instance, kills has fish with a knife as fast as caught he can put them in has bag or box with p rirect safety. A butchered fish, if loft in air or sin will be protected for hours by its own skin and be perfectly safe eating for some time

The other form, the fish that exude

posson or posionous bacteria fatal or detrimental to humans and edible fish,

also most deeply concern the laboratories. It seems with that all such forms should be tagged and placed most all the seems of the seem sonous to humans Strange as it may seem, the poisonous to humans Strange as it may seem, the blowfish which was formerly regaided as a pest by anglors has for several years become popular for the frying pan Upon its back are two strips of 'tender-



Picroise volitans, a large and much feared stinging

loin." Not only have anglers of late been greedly stripping these off, but the numerous fishermen a small hotels along the coasts have been serving the tenderloins as a deliracy. Yes this fish is poisonous and should not be eaten except by people whose atomachs are as immune as a goat a or ostroin s. Dr. tudger also warms against eating the berrauda as a fish causing promaines in humans from toole basteria. Some of the most poisonous fish of the world are found in the waters of Samos, Hawaii and the Last Indies generally although for that matter, equatorial waters everywhere have their peoular forms. Of these the

family Tetraodon tidae is most conspicuous. It is difficult to understand why these fellows, heavily armored as they are with stout spines, stout laws and teeth, should also need to crude posins for their protection from enomies. Jordan and Searle describe the several species. The group are more shundant in the East Indies than the South Seas. Phey are regarded as poisonous, although none of the species has the bad poisonous, authorign none of the species has the had repute possessed at Hawaii by Tetradoch hispatius. The natives call them sus, meaning puffers, or blowfish Hispatius is very abundant in the lagoons and mullet points. It is regarded as enceasively pointonus, mustimuts or deadly death, being its local name. Nigrepunctatus is very common about Apla and Pago Pago, and is likewise regarded as poseonous. In some instances the body is covered with bristles so long as to give stances the body is covered with brasiles so long as to give the appearance of cearse four The highly colored family Lutionus mostly with red shades, has possoones species of which monestigms as a conspicuous example. It is common at Apia with a coppery red coloration, and has no text ho not its lugue or Another large, brack-red species of the family, boths: with large canine texth, is possonous it ranges widely in the Esse Indice.

'Pterous volitans is a large stinging fish of Samos, Tahiti New Guinea, New Britain and the East Indies It is blackish red in color The natives call it Sausaules, because of its fluttering butterfly flight in water' It will be noted that this fish somewhat resembles the Atlantic sea robin in appearance There are however, tentacles on the had and it is armed with kind-like sprines and is anjable of stanging in all directions whatever it comes in contact with The sings of some fish are as deadly as their bites This fish also has bands of minute teeth to string with

are as deadly as their butes. This fish sho has bands of minute teeth to sting with.

Of the deadly sting rays of the Eastern Indian waters, Jordan and Seale name a new one, Rusantive Jos. The Tabitine call it Jos, the New Zelanders who and the pignas cos. Bung rays are severywhere deadly, on our begans of the Russian state of the Sealer water. Many prominent fishermen have been killed by their stings. They are difficult for layment of detanguah from ordinary skates, which fact should make all persons cautious in handling these triangular fishing. The rays have long whip-lash tails. In the sting ray, there are on the tail below the body, two portunding spines, or stingers, which the animal is vary deft in thrusting into his animycers by squarms, whether in water, in beat inch as animal superior of the sting still the would not the condition of health of the victim. The sting fluid, or fast sificate invested with tone besterns, quickly circuisties with the blood, permeating the whole system. Many people have been killed by the sting, and the life of Capt. John Runt is a slegged to have been saved following a threat only after eight another of careful trees only after eight promise.

by it mosts of careful treatment and number of careful treatment and number following a threat by a sting ray

Two terrors of the Eastern seas comprise.

Two terrors of the Eastern seas comprise fishes with poisonous spines They dart out from under rocks and from the depths of pools and thrust then virus fint disturbers of their peace, whether natives exclusions of water They have a wide range of habitat. They rejoice in the mance of Schostopels generates and subject, and Schostopelse generates and subject poisonous spines on the head, one differed leyward and the other backward, spines on the chesk and 11 strikes on the other habits of the result of the subject of the subject



Poison-bearing spikes of the giant rayfish, which inflict a dangerous wound

spawhere about the fins and body one species has a deadily spine at the base of the under part of the body, so that he can fairly at down on a victim and sung him. Two other spinous species are even more interesting demonstration of the spinous species are even more interesting demonstration of the spinous species are even more interesting demonstration of the spinous species are thrust into cuemias approaching it behind forward, it is protected by the sharp test in its long south a heavy spine on top of the head and a short, stout spinous on the center of the belly. Even more dangerous is the trunk-shaped filse-top of the spinous of the spinous of the center of the belly. Even more dangerous is the trunk-shaped filse-top of the spinous of the back of its bead is armed with spites Bellow is a heavy, movable spine with an armsture or battery of heavy spikes. The snout is equipped with knife-like tests The downs is planed find of uncomely form most dreaded by them Its name is Spones a and it abounds in the title pools and about the coral reside the pack in, make it exceedingly dangerous to handle.

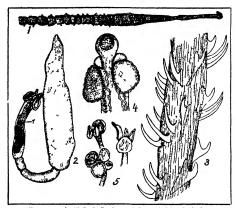
From the other side of the world, Africa, comes Pretopterus to the American Museum Herbert Lang, the African explorer says of it "At Nouvelle Anvers exporer says of it. "At Notwelle Anverse the natives are very much afraid of being hitten by the live Protopters which they bring to the market in pots of water Whee one is thrown on the ground it is

very active, wrigging like a snake and moves along in a like manner. These fish live in the dry sand when the bottoms of the rivers are on top as (Continued on page 40)

Changes in Iron After Repeated Heating

Changes in Iron After Reposted Heating
AT a recent discussion before a large British technical
Associaty of certain changes in cast iron after reposted
to the control of t actual volume, but only a change in the position of the steel Incidentally it might be remarked that the result obthe third suggested the somewhat startling hypothesis that if an oblong bar of soft steel were to be heated and cooled a sufficient number of times under proper

conditions it would eventually assume a globular shape conditions it would eventually assume a globular shape An almost perfect instance of the effect here so well predicted was cated by another metallurgair at the same meeting. In order to warm a small tain of water used for molding purposes at the workshop of Robert Rogers & Co., Stocktos, England, a piece of tron, weighing several pounds is facted over a color branning-five of blood-red fact, them questioned until it as nearly cold.



nt centode (2) the deadly pigs or 1 lie centode below the head at r s the centode enlarged from a d a neter of 9 millimeter (4) larval centode proboscie of the centode enlarged (5) three enlarged views of the cer Poisonous parasite (enlarged) which the sting ray injects into the wounds it creates

Some years ago a cylindrical pit c of soft steel similar in shape to that shown in the illustration was cut from a rigid har of about 3 8 inches daimstr. and used soled for this purpose. The analysis of the steel was a follows Carbon, 00 5 per chri silicon 00 10 per cent phosphorus, 008 per cent suipplier 005 per cent managance 0 45 per cent

About 200 heatings and querchings were given in a



After 800 heatings and quenchings, the block of steel shown at the left had developed the shape at the right, passing through the central stage

your and in the course of four years of this treatment the orlandrical piece had gradually become nearly sphoreal in shape, as shown 'n intermediate stage in the transformation is seen in the center figure of the illustration, which is a photograj in of a smiller piece after it has been subjected to about 200 quenchings. The remarks quoted above are clearly illustrated by these examples, the pressure on the botter internal

metal due to the more rapid contraction of the chilled outer layers having ulti mately caused the piece to assum the globular aspect shown in the third or second figure of this illustration. Meas urements taken indicate I that after 800 quenchings the cylu for had contracted in length about 0 5 in 1 s and hal also increased it width by a corresponding amount. Fach quenching it ust therefore have caused a maximum displacement of material in a lateral direction of about 1/1000 of an inch

Pressure Marks on Photo Plates By M Luckiesh

SEVI RAL years up while scrutimizing D some photespi tragraphs for fine detail certain irregular markings were found which excited a suspicion that they might be made by ions present in the ai owing to the particular conditions sur rounding the work I urthermore owing to the fact that these tracks were found only on one type of panchiomatic plates and not on any of a number f other types of plates while were used it appeared that they were peculiar to thus particular plate for some reason \ arious experiments were conducted to ascer tain the origin of the tracks including the development of several dozen new plates which were unpacked in the dark room and immediately developed without being subjected to any possil influence in the laboratory The tracks were in the laboratory I he tracks were found on all these new plates of this type

which were obtained several years after those on which the tracks were first noticed and further investigation did not reveal any on other types of new plates

It is a fact of photography that a latent image can be

It is a fact of photography that a latent image can be impressed on a photography platt by minute abrasions of the emulsion surface. These are known as pressure tracks. The particular typs of platt under considera tion appeared to be packed as well as others in the gright of the packed as well as others in the packed as the packed as well as others in the packed as the packed as well as others in the packed as the packed as well as others in the packed as well as others in the packed as the packed as

of gritty substance being rubbed against the caulsion because similar tracks were reproduced in this manner by using fine particles of sand. The individual mark particles of sand the individual mark ings or pressure marks are too small to be troubles me in ordinars photography but are visible under careful observation to They can be very anthe maked eye They can noying in photo microscopy

noying in photo meroscopy

The illustrations are high inagituteations of the original tracks and are of some interest not only photographically but from the standpoint of the auties of a small particle rubbed between flat surfaces. Fig 1 is the result of magnifying age a nest of tracks about fifty times. The long trail appears to have been made by a single particle. This portion is seen at a higher magnification (about 126 times) in Fig 2 although in cidentially this photograph is aversed as if Tie 1 a were contact that the property of the property of

Fig. 4

magnification (about 120 cinics) in Fig. 2 minorgo to cidentally this photograph is reversed as if Fig. 1 were seen in a mirror. The more complicated region of Fig. 1 seen in a mirror ine more compinented region of 11, 1 is soon enlarged (and reversed) in Fig. 3 to the same inaginification as Fig. 2. The character of the darker or heavier spots is shown in Fig. 4 greatly magnified. although this photograph is of a different subject



Mechanical Equipment of the Farm

Latest developments in agricultural machinery and practical suggestions for the farmer

Constacted by HARRY C RAMSOWER Preference of Agrecultural Engineering Other State University



Dredging the outlet of an open ditch drain



Machine for gathering own and binding it into bundles

Cleaning and Deepening the Open Ditch

ONF of the phases of farm dramage which is too often neglected is the open ditch i or land dramage we rely upon underdrams almost exclusively but all tile rely upon underdraus almost exclusively but all substances or many into the spen dato. The wital importance of this ditch comes from the fact that no under dram can be better than its outlet permits it to be More often that not this outlet ditch is filled with grass weeds and trash to such har state that the tile emptying into it are completely elogged at the outlet and are thus largely uncless.

In large ditches serving as the outlet for a considerable area of underdrained land the dredge is used to good advantage. If a large volume of water is present a floating dredge is perhaps most convenient. In the greater number f cases however large ditches are needed—too large to be cleaned and deepened by the use of horse drawn scrapers yet not large enough to take a floating dredge

noating trenge
The dredge shown on this page might be called a dry
land dredge. It is supported by heavy timbers on the
banks of the ditch. A convenient frack is laid over
which it may be propelled. Its powerful host enables
it to cut through trash roots etc with comparative case.
Where the extent of the work justifies it will always pay. to use a machine of this kind rather than to rely on ordinary scrapers drawn by horses

The One-Horse Gasoline Horse

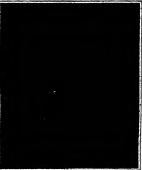
THE title may sound rather odd yet no other term seems to convey the right meaning. The larger sized tractors are intended to do the work of two four six eight or more horses and many times they are thought of in terms of the number of horses whose power they of in terms of the number of horses whose power they could But the one-horse tool as a necessity on most farms while in many instances as on small farm of the more than any other tool. It remained therefore for someone to design a machine that would find favor where the one horse poly was the chief saus or where a consider able amount of hand labor might better be done in some ore rapid and more profits able way.

The garden tractor shown on this page is the result of effort along this line. As the machine stands it is 72 inches long 17 inches wide and 36 inches high. It is equipped with a single-cylinder motor 31,2 x 41/2 bore and stroke with a belt speed varying from 300 to 2 200. The total weight of the machine is 550 pounds

It can readily be seen that this tractor is capable of doing only very light work The plaw which it is intended to pull uts a 7 inch furrow and the various tillage at-tachments are of correspond tachments are of corresponding size. It is easily handled in garden work. There is, nulley attach in garden work. There in addition a pulley atte ment which can be used for light belt work. The diam-eter of the pulley is 43% inches and it runs at 800 revolutions per minute at

normal engine speed
A machine of this kind. onestly built should fill a eal place in our immense ruck gardening business

The individual who washes a garden of something larger than average size can use it to good advantage. If might also be used to faye a large lawn mover where a considerable area must be out regularly but where the sus would not justify a power mover. The hole difficulty which users of its type of machine will encounter a this—they will expect too much of it. Its limitations must be recognized. It really does not possess the power



Plowing with a ens-horse gasoline horse

While it is true that a horse at steady work of one horse. While it is true that a horse at steady work cannot develop more than \$\frac{1}{2}\$ flores-power, yet in an emergency and for a short time he can multiply this effort many time. It is first this reason that those who have been accustomed to using horses are frequently daspointed when they indertake the use of motor power. This is not a cititetism of motor power that statement is made to federated possible disappointeems.



The gaseline heree as a stationary engine

A Loading Attachment for a Cornbinder

I T has long been recognised by practical farmers that the handling of the corn crop is one of the hardest take of the entity year and one phase of farm work which, in spite of numerous labor saving meahines, still calls for a large amount of hand labor. The various types of so-called aled cutters work very satisfactorily if the corn stands un well but now from the composition of the corn stands un well but now from the corners to lead and stands up well but oom frequently becomes lodged and twisted so that these simple machines cannot be used at

all The corn binder will gather and bind into bundles, even badly lodged corn, but it is not an easy task by say means to pick up and set the bundles is aboults. A number of attempts have been made to devise shocking arrangaments for different forms of corn bavvesters, but none of them have nest with much success. It has always been found next to unpossible to make a shock that would stand erect for any langth of time. In the hands of a skulful operator fault good work can be done, but, in the main aboutlers have never become widely used

The attachment shown on this page has already be nto suscentinent known on this page has arrively been to wide practical use and with conniderable satisfac-tion from the mechanical point of view That it is a remarkable labor saver there can be so doubt. It san be used, of course only when the corn is put into a silo, but this means no small amount of hard work and hand labor saved annually, when the country as a whole is

considered
The photograph at the head of this column shows
the machine in service, being hauled by a tractor
drawing the core to the control of the control of the control
drawing the core bunder. This tool is a lower dust
machine—more than a load for two horses, and it seems
to be rather awkward and inconvenient to use more than
two Further, the machine works much better if drawn
at a steady rate.

Coment Drain Tile

THE question as to the merits of sement drain tile, especially their desirability as compared to day tile continually being resised in the missed of farmers. This is a proper question and deserves consideration in the first place let it be said that there is no reasons why first class drain the should not be made from estimated and good, deen send or fine growed. The makerials should be missed in a proportion and lesses that it, we need to consist to these said of the day of the said of the sa

The Continuous Nitration of Hydrocuris

The Openinsone Nibration of Hydrocarbides of Paris mirration of hydrocarbides, or griserine and of a solitions, which is the previousnary steps in the manifestits of providers and other explosives, was nearly askeys a discontinuous openation before the war. This discontinuously was practiced in order to avoid the danger string from the high temperature discontinuously on compactavely small quantities cooling in facilitated and charger in the sace of explosion is insisted. But the sace of explosion is insisted. But the sace of explosion is insisted of the present war and the searcity of man power have caused in receives to such processes permitting restriction, at its seat in the case of insistence produced in the present war and is the case of the produced produced in the case of the produced presents of the search of the present of the principle of the well known absorption columns and gas weathers. The meaner in which it opens the has been recently described by A. Siethscher in Technical and for the present of the present o

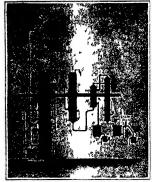
As shown in the accompanying diagram the apparatus consists essentially of three colonins. A, in which the situation of the bennine is effected. B, which is a waher in which the nitrobeanies formed in the column A is freed from the soids which it has carried down with it,

siteration of the hemita is effected. B, which is a washer in which the airtobeanise formed in the column A is freed from the acide which it has carried down with it, and C, in which the airtobeanise is dutilized.

The disseases and the relative position of these three columns have been so arranged that the liquid streeds from the first to the last merely through the state of the reservoir G which contains the suffonition seld muture. Furthermore the cesspe valves also essure regularity of flow throughout the whole apparatus.

The brainest counting from the reservour D, after having passed into the regulators of flow throughout the whole apparatus.

The state of the regulator on (which regulates both the flows and the presence), passed throughout D, after having passed into the regulates from the state of the sta



The general scheme of the apparatus for continuous nitration For the reference letters see the text

The continuous cooling of the liquids in the column of nitration is insured by means of four cold water serpen tines placed in the middle portion of the column. Then flow is regulated automatically by internal thermometer which set in action distribution sluices by means of

The exhausted said collected in I is almost free from



To illustrate his suggested changes in the standard railway tie, a French investigator presents these diagrams, which are explained in the text

nitric acid it is dilute sulfuric acid which may be use again in the manufacture after having been reinforced by the addition of olsum or sulfure anhydride and of fresh nitric acid Finally similar apparatus to that just described makes it possible to transform the mononitrobensine into dinitrobensine and the latter into trintrobensme

Improved Sleepers for Railroads

A FRENCH railroad engineer M A Auric has come to the conclusion that the priest method of constructing roadbeds is faulty in principle and is largely responsible for the wear and tast to which they are sub-

His criticisms cover three main points the rigidity of the cross tie or sleeper in the longitudinal dir tion the manner in which the rail is fast incl to the sleeper and the insufficiency of support at the junction of the

and the matflixency of support at the junction of the rails. In a recent article in J. Germs Crist has apported his argument by the use of the accompanying diagrams. Or and D. According to M. Aurie it has been provine by experiment that the loads and the shocks which are transmitted simultaneously to the ties at C and D are never equal or even approximately equal on the con-trary almost the total amount of the load is transmitted. trary almost the total amount of the load is transmitted integrally first at one point and then at the other because of the unavoidable signagging pitching rolling ste in the motion of engines and ears. Because of the rigidity of the ite in the longitudinal direction these and uneven loads cause it to rise (and fall) now on one side and now on the other and the incessant vibration thus occasioned tends to disturt the ballast of the road bed and causes the fastenings of the rails to become

This disadvantage can be remedied M Auric believes, by the simple method of making the tie thinner in the middle as indicated by the dotted line E F G thus preventing the two ends of the tie from having too closely conjoined an action and allowing them to act inde-pendently of each other under the strains and streams imparted by the load

Figure 2 represents the present method of fastening Figure 2 represents the present method of Isstening the rail to the tie in the transverse direction by means of cramp-irons etc, fixed upon the upper surface C D of the tie this upper surface having a width of 0.15 meters to 0.20 meters (5.8 junches to 7.8 inches)

meters to 0.20 meters (0.8 mones to 7.8 menes)
Obviously when the rolling load at M to the left of
C the tue will have a tendency to ank at A and to rue
at B when the load is at N to the right of D this action
will be reversed the effect of the constant oscillation is while the same as in the preceding case the loosening of the fastenings and damage of the ballast. The remedy proposed and illustrated in Fig. 3 is equally simple, proposed and illustrated in Fig 3 is equally simple, and consists merely in reducing the supporting surface C D to the minimum consistent with safety when suitably CD to the minimum consistent with salety when suitably reinforced. The weight of the load will thus be trans-mitted as nearly as may be to the center of the base of support A B which will have the effect of checking the vibration

As regards his third criticism the insufficient support of the rails at the point where they are joined M. Auric proposes that cross-ties should be done away with en tirely at such points and replaced by girders as shown in Fig 4 At present the practice is to place the ties closer Fig together at the joints than elsewhere giving the rails wide bases of support The longitudinal rigidity is thus increased with a corresponding increase of vibration.

As a consequence it is precisely at these points that the roadbod is most subject to damage.

Building a Bridge by Halves

HOW can a bridge be opened to traffic before it is completed? The answer is simple and obvious Build half of it at a tune so that traffic can use the completed portion while the other hall is finished in due

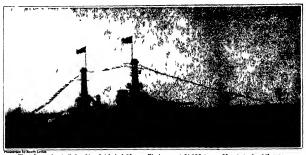
A typical case of bridge-building by halves is that of the attractive concrete structure recently completed across Lake Quinsigamond at the eastern edge of cuty of Worcester Mass

As will be noted in the accompanying illustrations this bridge was so much in demand for traffic crossing the lake that half of it was completed or from the el aborate arched face to the center line including a single track for the street car line The first half was completed and finished, even to the or-

and the asphalt pavement
With balf the Quinagamond bridge opened to traf
fic the builders turned their attention to the construction of the other half



bank. As real Concrete forms to pisce on the unfortan



The 'Pennsylvania," flagship of Admiral Mayo Displacement 31 500 tons. Mounts twelve 14' guns

Till residents in liverade Drive and Washington Hights New York Lave looke I div during the based quarter of a century upon many a naval received in the manufacture but in ver laws they wit measured a gathering of the shaper of the state o

were the state and the first controlled the consuming of over two hundred as part of our war pir giant. Holding the place of homor at the head of the line were the big dreading which we had the very day had retarned from their 13 muths of service with the Grand Fleet in the North Sos These five slape which w. it known as the Stath Battle Squidron of the Grand Fleet as the Stath Battle Squidron of the Grand Fleet Arksanss — I cases and Now Yor! The squidron is used to the state of t

coast of raiding proaching Ireland ready to attack any enemy force that might threaten as ap-convoy. The eleventh and twelfth force that mag...

The eleventh and twelfth were the two recently completed ally driven. New Mexico and appir of 32 000-tons displacement—the largest battle ships afford. In the dozen ships after included to receive are included. annels.

the very latest and most powerful vessels of our dread nought feet all but the last two of which had de no servee during the war in Europau water. I has followed the older ships—the predvadance, this course of which there were eight in lime. the sister ships Missouri and Maline the sister ships Missouri and Maline the sister ships Wissouri and Alabama the harrages of the Inwa and the Indiana. Which were in the battle off the worth the control of the Missouri of the Missouri and the Adaptance of the Crivers made he galant seed to the course of the Missouri of the decadic ughts are as follows.

	Tons	Hattery 1	Belt	Speed
New Mexico Mississippi	82 000	12-14	14*	21
l ennayivania	81 500	12 14	14	21
Nevada Oklahoma	27 500	10-14	14	204
New York	27 000	[10:14]	12	21
Wyoming	26 000	ua,	11	21
Fiorida Utah	29 000	10 12	11	21

The predicado nuglish are well known to the readers of the 'stantistics' American Compared with the dread nuglish they are choosite for the year from 11000 to repect 1 hey war, from 11000 to repect 1 hey mount four short 12 in h gure us the manustatures and from 12 to 16 short as made gus an the secondary betternes. The 1 reas carrier four 1 limb expits in high gume and the old hearness and Indiana expits in high gume and the old hearness and Indiana the part of the property of the propert





and by Kilom Layers

The Atlantic fleet in t



Bub-caliber gun practie



Turrets Nos. 1 and 2 of the "Texas", with airplane and platform on No. 2

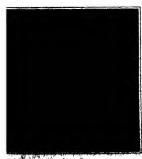


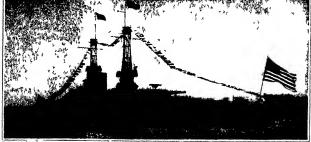


se for the review



one of the warnhing





Our largest dreadnought Mississippi' of \$2,000 tons carrying twelve 14 guns

Our largest dreadnought Missessippi' of the Sichh Battle Squadron will had served with the Grand Fleet under Admusal B in Victorees a year in the North Soa Later in this artist of the North Soa Later in this artist with the served and the properties of the Victorian statement which is first a vivid tapression of the very ardinous of the Fleet William of the West Statement of the Victorian statement of the Cread Reve of any will be the Victorian statement of the Grand Reve process the Victorian statement of the Grand Revenue and Caretton of the terms of the Victorian statement of the Advanced Revenue and Caretton of the Victorian statement of the Advanced Revenue and Caretton Statement of the Victorian statement of the Advanced Revenue and Caretton of the Victorian statement of the Advanced Revenue and Caretton of the Victorian statement of the Statement

secretained with great accurate but it is possible to see over the smok arriers such as the Germans used so effectively in the Judicial hattle to hide themselves from the British for real herosom for the pilot to learned human for it the same for lattle server, as out in the North lear, it there is no marked to the server of sporting or secuting was concluded the life factor of the pilot hat the server of sporting or secuting was concluded the life factor of the pilot hat to make him and the server of sporting or secuting was concluded the life factor of the security of the security



One of our istest 1200-ton, 35-knot destroyers

Inventions New and Interesting

A Department Devoted to Proneer Work in the Arts

Artificial Limbs in Quantity

VITH the greatly : reased demands for artificial limbs brought about by the great war manufa turers of such products have been complied to resort to quantity production methods. As a many of the have matalled automatic shaping latl es of the typesh we

ir the two ac omparying illustrations. As will be noted the operator | la es aroughly at naccof woodin the machine and then turns on the power I he cutting knives are guided over the rough piece of wood through the agency of a cirved rod which rests against a master wooden leg held at the rear Thus the cutters only remove as much wood as the master permits and the result is an exact replica of any kind of limb held at the rear
It will be seen that this

is another application of the

pantograph principle which has been used so much lately—notably in making propellers

The Rotary-Pole Magneto

A LARGE part of invention consists in A mere mechanical improvement a touch here an added detail there to make existing equipment function better

ldom that brand new prin ciple is laid down and applied and this phenomenon is therefore the ore interesting by virtue of its very scarcity We imagine that it must have been in pessimistic brooding over thu fact that the now

famous patentex aminer of the 1830 s who resigned because everything had been invented

P rhaps it will not be going too far to Primaps it will not be going dool as a put in the class of basic inventions the rotary pole magneto developed since 1912 for while this apparatus like older types ignites the cylinder charge by means of an electrical spark it makes in means of an electrical spark just about the production of this spark just about as fundamental a departure from estab-lished procedure as the nature of mag

netism and electricity would permit
The ordinary magneto embodies a horse The ordinary magneto emboures a state with the poles built out in concave pole pieces to provide a seat in concave pole pieces the armature. The in concave pole pieces to provide a seat in which rotates the armature. The magnetic flux that — ws between north and south poles of the magnet passes through the metal of the core in preference to the atmosphere because there it meets to the atmosphere because there it meets less resistance. But as the vore rotates the path through it of the flux must be reversed. While the shaded end E is in contact with the north pole N in the left-hand diagrams the flux enters at

the left-hand diagrams the flux enters at E and flows from I strough the core a moment later E as in contact with the south pole, and the flux must then flow through the core toward E. The electric current induced by the magnetic field in a coil of wire exposed to the action of the magnetism by being wound about the core, has a mannoun intensity when this reversal of flux takes place and the sharper that reversal the

greater the peak of the current. Since it is this peak that produces the spark in a magnet anything that operates to retard the flux reversal makes the currentpeak weaker and the spark less officeent

It the armature magneto there are two influences so working. The iron of the armature shows a tendency to

Rough stock in place ready to be shaped into an artificial leg

maintain its polarity a reluctance to reverse which slows up flux reversal And when the armature is in the third position shown it is neutral the ends are neither north nor south but are in contact with both poles and trying to be both north and south at once Flux

ore The general arrangement is shown in the cut. The rotating shaft runs from in the cut pole to pole across the gap of the magnet, ne longer through that gap between the poles. The pole-pieces are mounted on the shaft and when it rotates they rotate in contact with the poles. In place of the armature we have two field-



pieces partly surrounding the middle of the shaft, just as stationary pole-pieces partly surround the armature To make party surround the armature 10 make and break the magnetic circuit, each pole-piece has a lobe that projects, parallel to the shaft far enough to brush the fieldpieces in rotating These lobes are opposite one another on the shaft just

polarity causing a definite magnetic abort-curouit during the instant of bridg-ing with a seavenging effect that alimi-nates all stray lines of flux, and clears the current intensity is thus obtained which the old-style magneto cannot approa-

This means a better spark, more there ignition, more rapid more complete combust and as a final consequer

ore power. Nor is this all The arm Nor is this all. The arm-sture magneto gives exactly two sparks for each revolu-tion of the armsture shaft-one for each flux reversal. But the tendency in engines is ever toward more cylinders, which means more sparks per revolution of the engine shaft. This demand is met by a gear bet shaft so that the latter turns faster than the for-mer but even with this, we

mer but even weta tank, have by no means dispo of the matter completely Engme apoed are always going up, A while ago a fair average was 1, revolutions per minute Today few gines work at less than 1,400-1, revolutions, the Liberty makes 1,9 while the latest wrinkle of increase power by gearing down from shaft

then mean say-where from 5,000

shaft, and this, is

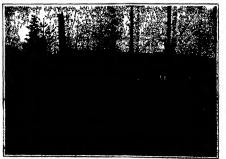


Three stages in the working cycle of the armsture magneto (left) and of the retary-pele type (right); and the general arrangement of the latter (center)

and in both directions through its shank. making for gradual rather than sudden reversal Indeed this is actually the process of gradual vs sudden reversal, so the peak of the current in the coil is

In 1912 the first patent was granted for a magneto with rotary poles and fixed

as are the armature ends in the order type. In operation the rotary pole-piaces retain their polarity without reversals. There is thus less reluctance because less thus less reluctance because less than the control of the property of the over in this neutral position there is precision instead of confusion. The gap is now bridged by a place of constant now bridged by a plece of constant



An electric donkey-engine for legging

addition to its normal bearings, early two pois-pieces that have contact over a broad surface with the fixed poise (Commune on pings 42)

Logging by Electricity

D' converting waste lumber and say of the control of the refuge by the refuge by the refuge by the refuge by the control of the refuge by the control of the refuge by the refuge sawaill company in well-control of the refuge by the re

Making or Marring the Strength of Steel



PIECE of steel is a bundle of very short fibres, more or less hard according to the amount of carbon they contain, more or less strong according to their relation one to another

When a blacksmith heats a bar red hot and forgos it out into horseshoe shape on his anvil, all the fibres of the steel are bent into the horseshoe shape of the finished forging. They remain in proper relation one to another. There is no decrease in their strength

If, however, we were to make a casting of this horseshoe, the fibres would run in various directions, and this would be a source of weakness. The metal would be hard, but brittle

This is why forging is superior to casting where both hardness and tensile strength are needed, and it is why forgings are now, to a very great extent, supplicating castings

Now, even in forging, there is a right and a wrong way of hammering

If the forging is ignorantly or carelessly made by a single great blow of a drop hammer, the outside fibres of the steel are more compressed than those on the inside

If, on the other hand, the forging is made by a series of carefully calculated and nicely adjusted blows (such as only long experience can accomplish), the fibres are more evenly compressed throughout, and a finer grain and greater strength result

By an intensive and exact knowledge of steel and its methods of treatment, by the ideal, best expressed by C E Billings when he said, "into every forging goes our entire reputation", by half a century of steady progress since Civil War days, this company has reached its present position in the estimation of the world



Electrical Devices

26

OUTLET ROX (OVFR — Figure care of Morris Roth 185 Duane 8t. New York N Y This invention relates to olderly white attachments and Lase path ular reference to outlet bores adapted for cellinas walls or the like Among the objects is to i of nitlet box over havins. "ordishe means for means for the contract of the contrac of matica box or ver having. It reliable means for sexuring the cover to the less than is ordinarily empios ed

Of Interest to Farmers
CUTTER IAR FOIL MOWERS E. Acer
Homesteed Ore This in the relates to an
acta himen for moving rashfilmen wheely a
clear-cut can be made at the outer ent of the
funger har. An object as it provide an attach
ment which can be costly and quickly as it id
to a moving machine tho arise thus at length
the from of an extension of the finer; has for
machine an upward-tust at the cut of the disk to as

nacing an upward cut at in cod of the six fear.

COTTON CHOP! Ext.—J I Dow : 5 4"9

Steward Ave Atlanta Ga. Ihis invarious relaces to insplanement for chop plans, set simplicate
cotton plants and more justicularly so an
apparatus for this purpose of more plants and sold in which rotary
cinophage skements are arraneed to term should a
vertical axis and to have a unp and come movement out which thoughout the front arranged to

be allowed laterally, and cultivarce shoulds as adjusted laterally and cultivator shovels at



A PART) & SELTIONAL SIDE E SVATION

which clamp jaws are incorporated adapted to grip the material of the sleeve in addition to the holding action due to the resiliency of the hand as a whole

FILING DEVICE —E E RETTIO Kevtesville Mo The invention relates to filing devices in the form of a spindle or rod on which letters MO. The favoration relates to filling device in the force of a spitule or rod on which letters the force of a spitule or rod on which letters bills accounts cause of eard systems or the restriction may be justed the prime object in property justed to prevent a file in which relatively mostable according a rearranged in a novel manner to premise ready accoss to and recovered of any particular cloter or the like without tearing.

STARRING MIXTURE FOR ANTIMONY STARING MIXTURE FOR ANTIMONY SMELLING —Octor VI WAN PLANDIGUACHE BLEE DIE SERGEN KARIOW China An object of thai invention is to product a sile or starting compound. Another object to to utilize a by product of the refuling of antimony which is at present disearched as useless. The mixture is compound to me utilize the process of antimony smelling and an saladi metal exchange of the mixture is composed of the mixture is composed of the mixture is composed to first mixture in the mixture in the mixture is composed to first mixture in the mixture in the mixture is a start of the mixture in the mixture

shall metal carbonate
\$\$AMP E TAB-B F Street. 644 First Are
New York N Y The object of this invention is
to produce a sample tab so constant set dist
not only will there be a saving in the res of the
materials used but a sample had which shall be
of lighter weight and will its faster as compared
to those made bereiofore and by the use of which
a sorting in the cost of transportation will be

PIOTURE HOLDER—Z ORMANOFF 200
8 Front % Steelon Is This invention re-lates to hangers or holders for picture frames mirrors ormanental panels or the like it has perticular reference to hangers that are adapted to support the picture frame from the side edges of the upper portion without cords wires acre

ROLLER BEARING -A GOLDEN 945 Hou

RECENTLY PATENTED INVENTIONS registering grooves and a split ring engaging the registering grooves to hold the rollers in nahled relatio

HOG FEEDER -F H PAGE Waverly, lows The invention more particularly relates to a feedbarranged in connection with a hopper to be actuated by the animal for feeding a limited



A VERTICAL SECTION OF THE PERDER

quantity at each operation An important object is to provide a feed device with actuating means as formed as to bring about the operation thereof by the snow of the animals approaching the feed outlet the device is so arranged as to privent elegating or packing of the feed

WHIFFI ED GUN CARRIAGE WITH WIDE be adjusted intensity and cultivator showed at the rear of the chopper.

Of General Intercest

ARMINIAND I, F. NELSON P. O. Bits 602.

Beremeron Wash. The investion relates more particularly to that typo of slower supporters in the general form of a resilient band to noticit is the general form of a resilient band to noticit is the arm and support the slower in adjusted joel on. The prime object is to provide a least in concentration and many portion of the content o

> PIOTTING BOARD -J D McCARS 1215 Union Bank Building Pitteburgh Ia This in vention relates to a plotting device the object being to provide a construction whereby deed



A TOP PLAN OF THE DEVICE

crors in transcribing will be eliminated

RAMEN FOR OIL AND CAS BEARING

SAND—A OTO 200 Seart Building Kannas

(liy Mo The invention relates to appliances for

nil well is elobert is to provide a construction

for rumoving part of the size and oil beaching

andstence of an oil well so se to allow a free flow

of nil and gas Another object is to provide a

remains device furnished with a continued.

reanting device Curnished with a contribugal reasoning structure and means for removings the removed and and deposit PLANKING CLAMP —T E MARIEN Box 500 Madisonville La The object of the in500 Madisonville La The object of the in501 Madisonville La The object of the in502 Madisonville La The object of the in503 Madisonville La The object of the in504 Madisonville La The object of the in505 Madisonville La The object of the in506 Madisonville La The object of the in507 Madisonville La The object of the in508 Madisonville La The object of the in509 Madi

nat surrace a concave or a convex surrace.

RECTIONAL LINK—J M TOMESON care of Rox 16 Souriske Texas The object of the invention is to provide a sectional link dasplet to be readily opened and locked to hold the parts in coupled relation. Another object is to provide a link more especially designed for me in all well drilling tools to prevent benefits of the link was difficult to the contract of the contract of

the use of brake or stop elements adapted frictionally sugage a guide red on a wind frame for holding the states in any given adju she has indirect and out without congested the integral delivery and to simplify the construction of the separator. The device comprises a plan-nity of tenther sizes it is designed to the late supporting meet, the mast being provided with a certain of spentings addronat the lower inner edges of the light or extracting file how mineral from

most CUT GAGE FOR MACHINE TOOLS.—
B Rirmser case of Ganeral Delivery, America, Coug. Among the principal objector of the trends are to turnible most policies of the trends are to turnible most policies of the previous are to the country of the previous of the court to be performed to indicate optically the artest of movement of the tool to rapidly adjust the tool to the work routined, to avoid ownering the previous of the section of the

Reating and Lighting

Reacting each Lighting
OAS BURNER—R N Howes, address H E
Almberg care of Consolidated Gas Co. 130 E
Libb B. New York N Y I This invention reLibb B. New York N Y I This invention reto regime constructed for burning coal gas wood
or regime constructed for burning coal gas wood
or etc. An object is the provision of a gasburner
using a combustion militure and cersain arrangement of pipes and host redshing material wheatly
addresses the supply or mixture of air and gas
others are constructed from the control of the control
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WORKMAN 8 STAND FOR OAS ENGINES

J B Trains, one of Constitution dates President of the Constitution suggests on the Constitution suggests on the Constitution suggests of the Constitution suggests of the Constitution suggests of the Constitution suggests of the Constitution given volume of gas
THEST LAMP —F MILLIERS 58 John 81
Now York N Y The Invention relates to line
Now York N Y The Invention relates to line
In patient No. 18 she It is issued April 204 1918 to
the same inventor Among the objects is no
provide a series likely with the based or casing
regarders are the state of the catalog may be
assed by a testin officer for controlling the
traffig while not in any way interfering with the
section of the Euler.

Machines and Mac

Frime Movers and Their Assessmentes
POWER TRANSMISSION AND SPEED
CHANGING MECHANIMA—6 V DOMMAN,
address J S Dickman Mespareiville N Y
The object of the invention is to provide a power
treasmission said queed changing mechanism for
treasmission said queed changing mechanism for
treasmission power from a notion of the contreasmission power from a notion or a divisus
shaft to a driven shaft without appreciable lose
and to permit the operator to needily vary the
speed to any desired degrees or to reverse the me
tion of the driven shaft. the spudding purposes

NEWSPATER VENDING MACHINE.

O J HOTALING 400 ORden N Newsch, N J
A specific object of this invention is the provision

offer and with their cond overbanding or pro
pictup heyroad their support whereby a simple

and effective dispension; element can onspare the

outermost paper and a wing the same off the

older of the support so that, it will drop out of

the dispension; pecching of the collines;

the disposancy opening of the causest.

REVER'S WINDER FOR PI'MS —P J
PROCED BII W 147d St New York N Y
Among the Only is of this Investation to provide
not be a provided to the provided to the provided
in the nature of a receiver into which the film
from a projecting papears has a conserved and
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projections applies that only a fill the projection of the roll of the roll in the fill and the outside
of the roll ready to be districted from the fill

projection applies that only a fill the projection of the roll of th

VENDING MACHINE—I GOMICE 4023 N 30th St. Omaha Neb Among the objects of the invention is to provide a vending machine in which a novel delivery means is used which is operable only after a coin of predstermined denominate value has been deposited in the machine such coin serving as means for operating



DESIGN TO MILES OF THE MACHING CONTROL OF THE

sion of the driven shaft

Railways and Their Assesseries

AUTOMATIOTRAIN RIGNAL—M B BULLA

AUTOMATIOTRAIN RIGNAL—M B BULLA

AUTOMATIOTRAIN RIGNAL—M B BULLA

RIGHT STATES

TO A STATES

TO Pertaining to Re-BASEBALL GAME APPARATUS Rucz 530 Broadway Brooklyn N Y

coport or the invention is to provide a baseball, same apparatus more especially designed for the use of two players located at opposite sides of the game table, which represents a baseball field, the apparatus being arranged or sequire consider-able skill on the part of the players to successfully play the game according to standard or league

DESIGN POE A SHIPT OR SIMILAR BODY GARMENT ---W H DUTCHER, address Chas Boari 1848 President St Brooklyn N Y This body garment design provides maximum

the natured materials.

FRAMINO DEVICE — P. O TAYLOR, address
Class M. Frankhauser, 440 Fourth Ave. New
York N. Y. This investion; release to a froming
derice for moving picture statistics, the objects to
to provide a stantile and interposate device with
which the franks of the printerposate device with
which the franks of the printerposate the firm one is
accountilized with greats each and comparatively
no strain on the film.

Prime Movers and Their Asse

the mixed materials.



DESIGN FOR A PLATE, PLANUE, OR SIMILAR ARTICLE T. S MASSES, SO Welself Ave. Bross, M. Y.

The American Ace airplane ignition

Victor in a thousand battles!

Leader by right of achievement!

Holder of flying records!

Reliance of airmen the world over!

The magneto, recognized by every fighting nation as the incomparable form of ignition, has the Aero Dixic as its supreme representative by virtue of its selection as standard equipment for aircraft engines by the U. S. Government.

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SPLITDORF ELECTRICAL COMPANY

Newark, N. J.

Sumter Division: 1466 Michigan Avenue, Chicago

Dixie I American MAGNETO

Are You Going After Foreign Trade?

If so, are you sure that your inventions and trade-marks actually belong to you in foreign markets?

Unless you avail yourself of the right to acquire foreign patents and trade-mark registrations, you may find that another has preceded you and has actually appropriated your inventions and trade-marks and obtained legal ownership thereof, whereby he can bar your goods from foreign markets Such a proceeding is permissible under the laws of many foreign countries

Many have lost their markets in certain foreign countries by overlooking this fact

Many of our clients are preparing to extend their business by seeking patent and trade-mark protection in foreign countries

We should be glad to have you avail yourself of our services

Foreign Patent and Trade-mark Department

MUNN & CO.

New York City

Reconstruction

A Department Devoted to the Improvement of Old and the Develops

n up cd a new department sumed to a n un cd a new department aumes to assess it the reconstruction of our undea-tries in those unsettled days following the signing of the armistice Many lecture to the Reconstruction Editor or mending the Scientific American for un) rinking this service Manufacturers while have built up organizations for the king new lines of manufacture adapted the machinery with which they are quipped have written the Editor for information regarding promising invasi-tions and for suggestions on new lines of immuniacture. Responding to these ap-peals our readors have offered many interesting ideas covering a very wide range of subjects

Manufacturers are urged to tall the Reconstruction Editor their needs He Reconstruction Editor their needs He will be glad to help them with their problems and if they so deare, will withhold their names from publicity so that they may not be deluged with a flood of correspondence from unreacted invested and their constructions. ondence from unpractical inventors By stating in detail just what th iems are what is their equipment for new work and the character of the work they would like to take up they will facilitate the task of the Editor and eliminate much

Inventors are urged to exercise judgment in presenting their wares A well developed invention that can be demonstrated with a model is far more likely to receive con sideration than one which merely exists on paper A photograph and blue prints of working drawings are far more con-vincing to the average manufacturer than vincing to the average manufacturer than a patent drawing One correspondent submits his patent claims without any accompanying illustration Some of our correspondents have offered good suggestions which they confeas are not protected by patents Some have trad to sell mere ideas not embodied in any concrete form—ideas so vague that, if would require the exercise of inventive faculties to develop them sufficiently to be patentable Obviously such suggestions

are practically worthless The average manufacturer is not an nventor. He does not care for abstract ideas Inventions must be presented to the patents that cover the nventional because a patent is evidence of novelty and a guarantee of protection from com-petition But in order to gain an adequate conception of the invention he must have it well pictured and preferably embodies in a working model

Those who are prepared to submit a working model should so state in their letters Do not send models to the Re-construction F ditor He cannot handle them Instead send him photographs of models

are in proper form are forwarded to manu-facturers who are likely to be interested in their subject matter

the Reconstruction Editor of the

SCIENTIFIC AMBRICAN In the current usus of the Somer mic American I note the announcement of a new department devoted to reconstruction problems recently started under your direction and wish to extend to you the compliments of civic workers generally upon this far-sigh ed action

upon this far-sighted action

The Municipal Reference Library has
given considerable attantion to the problems of reconstruction and we have comtems of reconstruction and we have com-piled extensive references on the subject. We have recently published a special reconstruction number of our weekly bulletin which perhaps may be of some use in connection with this work. DORSEY W HYDE JR

Municipal Reference Library. 512 Municipal Building, New York City

Wanted: A Factory

To the Reconstruction Editor of the

We note in the SCIENTIFIC AMERICAN of December 14th, a notice on page 485 under head of Reconstruction, to which

e reply We have perfected and patented in the United States and applications for patents have been made in several foreign countries, have been made in several foreign countries, for an automobile non-puncture, non-blow-out, resilient tire. This tire is a process out, resilient tire ready to be manufactured out, resilient tire. This tire is a process product and now ready to be manufactured for the market. We have had sets of tires running on machines since last March and are now making molds to manufacture tires also we have arranged with a tire plant to manuacture under our own supervision tires in a small way until we get into a plant of our own. We are in corporated under the laws of the state of Virginia and have been closely investigated by the State Corporation Commission of this state and granted a permit to sell stock We have not as yet decided on a location for our plant, but have had offers from several cities However we are investigating all places from every source that will be of greatest benefit to our cor that will be of groatest benefit to our cor-poration before we decide on a permanent aome for our plant shipping labor con-ditions etc. etc. Our proposition means much to the community in which it is finally situated We are open now for many situated. We are open now for correspondence with factory firms who may have capacity plants for as industry that is all and more than is or has been expected in the touring car and truck tire world.

A Safe for Liberty Bonds

To the Reconstruction Editor of the SCIENTIFIC AMPRICAN

SCIENTIFIC AMERICAN
On page 485 of your December 14th
issue there as a request from a manufacturer for suggestions as to metal articles that could be sold in large numbers with

proper advertising
For several years I sold hardware over Cleaning House of Progress

The aim of the Reconstruction Dapartment is to become a cleaning house for for several years I sold hardware over the counter and on the road, and for the medial and progressive idea—to Ering house for gor a large wholesale and retail anxievant was the progressive idea—to Ering house. One of the first that I always felt wentors and manufactures—to bring the semantification in touch with wall invanitors and the inventor in touch with the value of the progressive interesting letters each to him, but he will see that those which save in proper form are forwarded to manufacturers who are likely to be interested in their subject matter. Here are a few of the many accorse of microsting letters which the Reconstruction Editor has received.

tective, substantial box to keep them intogether with other valuable papers, it
together with other valuable papers, it
think that advertising would soil several
think that advertising would soil several
that advertising would soil several
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retail around \$10 Millions of possible
users of these fans have been deterried
from buying them by the prehibitors peloce
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useful or salable in large numbers A good sanitary fireless cooker to sell for not over \$10.00 would be a been to hundreds of thousands of honewrines, and the buggest economy the could possibly put into that homes I finally believe that comeone will make a proper fireless cooker, advertise it thoroughly, and sell at immease number, because such a coaker. cooker, sovertue it incrugary, and see an immense number, because such a coaker is estentific, saves fuel, labor and worry, cooks food better, and is advertised by everyone who owns one

Electric Form Lighting Equipment

To the Reconstruction Editor of the SCIENTIFIC AMBRICAN

We are manufacturing an electric farm lighting and automatic electrically oper-ated water supply system on which we have several patents filed. The outfit is the several patents filed. The outfit is the ampliest of far designed for furnishing private utilities to country homes, stores, gans, sawmills, located factories, etc. it contains 40 per cent fewer parts than any of its few competitors and its a Ford idea in its field in that it lends itself to big quantity production and at a marketing price which would underself anything in its field

We cannot begin to supply the demand in one state alone, and due to the adverse manufacturing conditions in the South for manufacturing conditions in the Bouth for producing coupment of this kind, as well as the fact that the resources of a \$50,000 company are wholly insequent for a source for nationalising and handling as Blumans in a big, successful way, we are Blumans in a big, successful way, we are another than the successful way, we are another than the successful way, we are partially as the successful way, the successful way, but a successful way, the successful way, the successful resources and or successful way, the successful way, but a successful way, the successful way, the successful way, but a successful way, the successful way, the successful way, but a successful way, the successf by a big corporation to manufacture merchandise

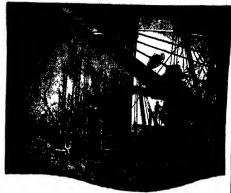
Our product leads itself ideally to his own product some result ideally to his volume production to undersell competi-tion and to dominate its field which is potentially of enormous possibilities and at present of negligible competition. If you care to cooperate with na in accom-

If you care to cooperate with us in our plan detailed information will be sindly

Electric Cast Iren Made from Steel Strap

A DEVELOPMENT of war conditions A DEVELOPMENT of war conditions to the steel inclusive of the United States has been the demonstration of the possibility of making pig from and the continue direct from steel complete an effecting form and the continue direct from steel complete an effecting form and the steel property of the steel been continued that of the continued that the form of makings, to fine supplies to the mans entropy made from steelings the from steelings the from steelings the first continued that the form of the steelings and the steeling steelings that the steeling steelings that the steeling steelings that the steeling steelings that the steeling steelings are steelings and the steeling steelings are disputed to the steelings are steelings and the steelings are steelings are steelings are steelings and the steelings are steelings are steelings are steelings are steelings and the steelings are s





That Bridge of Ships

The Sinews of Construction at once became the Sinews of War when it was decided to build and naintain a 3,000-mile line of communication between America and Europe.

legingled in the mine and forest every ound of material in our Bridge of 5h ps vas handled egain and again by wire ropes - allently efficiently expeditiously And s each ship was finished wire ropes put perd the equipment and the cargo sechanical stevedores of our great docks n the other side wire rope equipped re the marvel of France

From our entrance into the great struggle by far the largest part of Broderick & Bascom Wire Rope produced has been endeded directly or indirectly in war work

There is a grade of B & B Wire Rope best suited to every purpose civi and military Our grades include the calchrared

Yellow Strand Wire Rope

BRODERICK & BASCOM ROPE CO, ST LOUIS

Broderick & BascomWire Rope

The VILTER MFG CO

Corius Engraca Brewers SOLVINE BOILER PRESERVER Milwauhee Wie EUREKA MPG CO

Starrett Hack Saws Just one trial will prove that the Starretts will cut faster and last longer Write for our No 21B Catalog on fine precision tools and back saws The L. S. Starrett Company The World o Greater Too makers Have an arres of first Rows Unavioled

The I rench show an equal pride in great histoire figures and spechs when seeking ship titles but leaders in thought and civic action furnish inspiration as well Under the tu lor float the (harlemagne sector Irmish inspiration as well Under the til for float the Charlomagne Jean I Are and St Jous reminis-cent of en pure building and of the Cru sides Hitri IV tells the story of remaint havarres race t, to one of the greatest king of France while Charles Martil Tro mish the beholder of the here of a deen st eattle of the world the vectory of a deen st battle of the world the vectory of a decision to be the world the victory over the Saracens at Tours in 732 Over the Conde falls the shadow of the greatest of a great inlitary family and the Massina and Carnot breathe memories of the Napoleonic era. On the memories of the Napoleonic era. On the other hand mammoth dreadnoughts predreadn ights and battleships proudly ride the waters bearing the names of the philosopher Diderot (Who aspired to philosopher Diderot (Who aspired to the glory of Plato yet did not blush to imitate Plautus) and the statesmen of Revolutionary times Condorcet and Verginald The Voltaire and Vic Vergua id tor Hugo recall not only two of I a Belle France's most noted sons but two of the most noted mon of kttrs of any age and lan! The (ambetta and kerry suggest two wild immous statemen of the early eighties while Truth and Justice Denocra y and Republic proclaim the cultation of a country released rom tle autocracy of empire into the joy of freedom

Quite tl same catholicity of expression is found in Italy which places the Julius (gener and Andrea Dria mamesake of Charles lifth a in perial admiral along ade the Caribaldi and Cavour re spectively illuminated by thoughts of the fiery nineteenth century republican and the astute father of today s united Italy Two

or notable contrasts appear in the areo Pol substantial ghost of that Marco Pol wonderous thirteenth century traveller and Laonardo da Vinci redokut of the and Lonardo de Vinci redokut of the genius of the Renaissance and then there is the Columbus launched in the same class as the Dante The Dutch always a nation of seamen

honor their great admirals in the Tromp and De Ruvter and Germany appro-priately enough has graved upon her frightfulness Hindenburg Former military crises in the life of this nation are celebrated in the Frederick the Great cetobrated in the Frederick the Great
and in the Moltke and Roon Bis
mareks great coadjutors while the romance and poetry of the people shine forth
in Siegfried Odin and Undine
The component parts of the early United
for the new and speed in them the thing the

States navy evidenced in their titles the simplicity and vigorous atmosphere sur-rounding our ancestors. Besides the five now to be recalled by the new battle-crumers the stars and stripes floated over the Wasp and Hornet — simple perhaps but vigorous certainly In the war of 1812 both of these somewhat flery insects distinguished themselves as sharply as was fitting the one capturing the British ship broke while the Hornet stung the Peacock into a watery tomb Then there were the Scorpino' and "Asp," varitable watch dogs of the sea (to mix one a metaphora a little) The Allusnoe' named in honor of the bonds of friendship named in honor of the bonds of friendship-semented with France in 1778 twine bore the fortunes of Lafayetta scross that-lantic under the command of Commodore 'Jack Barry Stephen Decatur, in the old United States, deemed the fastest vased of her time, conquared the Ragilsh 'Surydec and "Atlants" during the second war with George III while that 'Congress (did a generous share in up-holding the dignity of the infant Américan

Old Names for a New Navy

(Continued from page 27)

mulitarist Napoleon Laviathans of the linespendence were represented in the linespendence were represented in the Manacolf v. Adams and the Hancolf v. A. dams and the Hancolf v. dams and the William of the War of the Hancolf v. A. dams and the Hancolf v. dams and the War of the War of the Hancolf v. dams and t

The memory of Lawrence is indisse The memory of Lawrence is indissolubly associated with the sangularary conflict between his ship of chaspeake and the British fright Shannon while that of Perry belongs to the great victory of Lake Eric and his Lawrence and Nigara. It was during that same war of 1812 that he anneamed the valual little achievance in the campaned the valual little achievance. th re appeared the valuant little schooner

the uninspiring C plus a bald number would be the Wasp or "Asp' or Scorpion?

It is a large pity that the present flosts of the United States so slightly reflect the mighty history with which she is endowed

mighty fisitory with which are is endowed
Among smaller craft are to be found indeed
Bainbridge Barry Decatur
Lawrence and Farragut, but there
are more full as worthy to be borne by our

are more full as worthy to be borns by our present-day see fighters One looks in vain for a Washington Madisen Lincoln of Washington Madisen Presidents identified with the five great war cruses of our past and four of those struggles at least were fought in generous parts of the work of the work of the week of the work of the week of the work of the week of the we

part on the water

Naming a ship does not call for so highly
developed a genus in kaleidoscopie phonetics as does Pullman car christening, but netics as does Pullman car chrastening, but none the less us is a matter of far more importance than may appear at a casual first glance. So Secretary Danishs move in the matter of these battle-cruisers us one to be unphatucally commended. It is to be hoped it may portend yet further ad vances in a good direction.

Weeding Out the Poisonous Fushes

(Continued from page 29)

it wert Indipeterus is another edible
Afri an fish which can stay out of water
account hours. When approached it rauses
its long dorsal fin and strikes with its
spines lac rating the hand. Here we
have both poisonous spines and teeth
le more imposing African fish of the fresh waters is Hydrocyon with teeth as large and outling as a man-eating shark s conical the outside row projecting out of the jaws and the inside row lying down to

contest the outside row properting out of the javes and the nander ow lying down to take the place of the outer teeth when destroyed I is as poisonness as a shark h Dr. Hugh M Smith Director of the Bureau of Fabieness Washington, described many of the ray fishes which however visuable for their akins as leather, are dangerous outcomers, causing septic poisons by their stangs or bates or both The Torpedo fish ranges from 30 to 100 pounds in waght "The fish is able to smit a very strong electric discharge from a visuable for "The fish is able to smit a very strong electric discharge from a visuable for the fishes of the take the fishes of t

PROFESION

Name Plates

RRISON DIATORS

> HARRISON RADIATOR CORPORATION

> > LOCKPORT NEW YORK



The Tool That Makes You Handy

Wouldn't you like to be able to do all of the little repair jobs around the house yourself-to be free from the nursance and expense of calling in paid help for little things like putting up a door bell or fixing the lawn mower?

Wouldn't you like to do other jobs quickly and just as well as the "handy man — hanging pictures for instance? You

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ed Devil' is the Espect Machanic a ide to know quality in Pilors, Electri-ne Tools, Hack Saw Frames and sides Auger Bits, Chain Drills, and nor Hand Tools, all of a class with Red vill Glass Cutters, the higgest solitors in the world

Weeding Out the Poisonous Fishes

(Continued from page 40) median row of very broad teeth flank he several rows of smaller narrow teeth
None of the above are true fishes. Some
of their reproduce by eggs encased in a
leathery capsule and others bring forth their y ung shve

just how numerous poisonous fishes are will be better known when Dr Gudger and these trush their investigations. and the missing their involugations. Far more dangerous to the public, perhaps are our dible fishis which have become infected with minute worms that act as he as arriers of texter bacteria. These

isease arriers go generally under the mitals the nematode is a known carrier of the germ of cancer A government report of several years ago showed that all American trout hatcheries had become infected and that cancer in trout become interest and that cancer in troub was spreading into the fresh water streams and also largely infecting some of the species of salmon. Trout of large bodies of water and salmon taken in salt water were not shown to be so affected. In July and August all species of edible fish perch tass etc in small shallow lakes and slow moving streams are known to be dangerous to cat their flesh being permeated with minute worms

Something like seventy species of fish parasite have been enumerated making langerous for food fishes of sluggish inland water. As a rule fish from deep salt water are most immune from parasites
if butchere I when taken from the ocean Those forms however which pass from salt water through brackish water (mixed salt and fresh) into sluggish waters are true of these fish that pass into streams or lakes infects I with poisonous wastes from factors s or which live naturally in such

Some forms of fish bivalves become infected with the germ of typhoid This has been especially true of such bodies I his been capeually true of such Dodles of factory and sewage polluted waters as Long Island Sound No body of water extant has produced so many cases of typhoid in humans as the soft and hard lams and oysters of Long Island Sound \ good second is Lower New York Bay. reeking in sewage and pollution from factories It is a crimic to allow bivalves from such sources to be sold in the markets The State of New Jersey has likewise had a hard struggle to rid its bivalve industries a hard struggle 1 in dis bivalve industries of the lower Delaware Ray of typhod infected products. The state has been forced to give grate eare to its natural owster beds and to the places where it is allowed to plant seed oysters. Thu has required eulargical police patrol and heavy penalties for infractions of the laws and regulations besides a heavy annual ex-penditure Notwithstanding all precau-tions occasional epidemics of typhoid

Cement Drain Tile

(Continued fr m page 30)

mexperience in the business the use of mixty reacts to lean a mixture too little water or poor methods of curing. As a result the breakage in hauling has in mary instances been altogether too great After the tile have been laid in the ground they should increase in strength and they will not be injured by freezing and thawing if subjected to such conditions as will softburned clay tile. This fact though, should not be used as an argument in favor

should not be used as an argument in favor a four opports made commut tile to poorly made commut tile it is only under unusual condutions that it will pay individual farmers to make their own commut tide. I have are a number of market by means of which it is possible to make first class tile. The process, hourself of the process, hourself of the process of the process of the process. I would not be a first class tile to the amount of the amount of the first process of the process. I would not be a first process to the process of the process

handled and if a good aggregate is close at hand conditions are somewhat altered and it may be economical to attempt the home manufacture of cement tile Again if a large number of tile are to be used and a good aggregate is close at hand one might to buy a large power machine make the tile on a large scale An instance is now in mind in which one fariner paid \$500 for a machine and made enough tile to drain 300 seres of his own land and he still has some 500 acres to tak

In a general sense the practice of taking one s time to construct an article made in a commercial way and on a large scale as questionable. Time is money now to a greater degree than ever before. If what greater degree than ever shorter in what is wanted can be had on the market at a reasonable price buy it. It will usually be of better quality than the homemade product and really cheaper if all things are

onsidered

This question invariably arises in the writer s mind-If good elay tile are to be had why consider coment tile? A well made clay tile will last for a hundred years made clay the will last for a nundred years—
even longer. The average farmer can
better judge the quality of day tile than
of cement tile. He therefore is not so
likely to make a mistake in this respect. If good clay tile and good cement tile are to be had at the same price he will be less likely to err if he chooses clay product On the other hand if the cement tile are slightly less in price and he can satisfy himself as to their good quality he may with econ my choose the eement product good eement tile should ring clear when struck with a hammer The surface material should not easily rub off and it should have a dense appearance and be free from cracks or checks | Here should also be evidence of water marks on the surface to make sure that they were not

mixed too dry
Some cement tile manufacturers make some cement the manuscurers make the claim that their their are superior to day tiles be ause water will pass rather freely through the walls of the the whereas it cann it pass through the walls of a hard burned day the 1t has long been recognised as a fact that little water does or is expected to pass through the walls of a clay tile—it enters at the joints. It has not been demonstrated as a fact that thus characteristic of cement tile is one to be

The Rotary-Pole Magneto

(Continued from page 34) The thing is a manifest mechanical impossibility One remedy consists in mount possibility One remedy consists in mounting several magnetos allowing each to fire its fair share of cylinders at 2 400 or 3 600 revolutions but while that would do very nieely on the ground the added weight is very serious in the air By means of a so called rotary sleeve the armature magneto can be doubled up and made to spark four times per revolution but this is the absolute limit and it is not enough

The rotary pole affords an escape from this dilemma We are here no longer restricted to two or four flux reversals per revolution of the magneto shaft we can have as many as we phase. For the pole may be built out to make contact with the field pieces not morely in a single lobe but equally well in m The wings of north and south pole must alternate around the shaft and opposite each north pole lobe must lie a south-pole lobe Subject to these re-quirements each pole may have as many lobes as we please to give it there will be a flux reversal every time a north lobe

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THE MARRIPSONS SO., Boot 51, Mooney 20 ft. Medicon St., Sect. 1985, Soc. Mohest Tell me, without obligation, all about the Magniphone and how it becomes mine.

One more rather conspicuous advantage hundred feet, where the log is attached to inheren in the rotary-pole magneto, with- the main line. Electric motors have no out mention of which our story would be creatests, to speak in eloquent terms when nonaplete. The coil must be wound about they are being overloaded The logging ore through which the flux passes or there is no current induced; so where or there is no current induced; so where the core rotates, the coil must rotate, too. But in the rotary-pole magneto the core doesn't rotate; it is way up in the bow of the magnets, quite out of the field save as the field is passed through it from the field-pieces. So there is no motion of the coil at all

This simplifies the mechanical end of the outfit. When the coil gow round, we have got to pick the induced current off its at its second control of the cont nave got to pick the induced current off it as it shoots past; and for this we need brush contacts and complicated circuit breakers. But when the coll stands still while it produces the juice, we can pick the current off it with the simplest sort of current off it with the simplest sort of

some and complicated moving parts.

Like the sewing machine and the telegraph and the harvester and every other graph and the harvester and every there goed thing, the rotary-pole magneto did not "burst full panpolied from the head of Jove," Jove in this case being embodied in an American inventor, Charles T. Mason. an American inventor, Charica . Mason. There was the basic idea, patented in 1912; and ever since, as in the parallel cases mentioned and in many others, there has been a gradual process of improvement heen a graduat process of which the original hy accretion, for some of which the original inventor was responsible, but much of which was contributed by others. It was the stimulus given, both here and abroad, by the war that lent the final touches to the present high state of development attained by this ingenious apparatus.

Logging by Electricity (Continued from page 34)

Aside from possessing no boiler and fuel-oil tank, the electric donkey does not fuel-off tank, the electric uomacy come ac-differ greatly in appearance from the steam yarder. The motor and drums, of which there are three, are mounted on a heavy wooden side. The main drum us driven by a train of three reduction gears, and has its ends filled with cement to deaden the poise.

The machine is now working at a distance of two miles from the power house A permanent bars wire copper transmission into has been installed to serve the engine. inc has been installed to serve the engine. The power is stepped up to 13,000 volts for transmission, and reduced at the scene of operations by a portable transformer to 550 volts. The motor takes its power through 500 feet of armored submarine cable, which can be laid with absolute safety through mud and water. This cable being wound with heavy steel wire, makes it rugged enough to be dragged makes it rugged enough to be dragged. through the brush, as occasion requires a moved by its own power, by attaching its main cable to a convenient stump or tree. The transmission line has to be extended in the general direction of the change of setting, as the moving radius

To provide for communication with the crew at work in the woods, a signal wire attached to an air whistle on the engine, is attached to an air wheth on the singine, is run out to the point where the load is attached. A boy gives the requisite signals at the direction of the hook tender, by pulling on the wire. The electric logging donkey being far lighter than the steam machine, requires adequate anchorate machine, requires adequate anchorate and the second of the steam of the steam of the steam that the second of the steam of

exhausts, to speak in eloquent terms when they are being overloaded. The logging motor is no exception. It pulls to its capacity and quietly stops. The rigging men, when working with a steam machine can tell from the sound of the exhaus whether the load is too heavy or whether a stop is necessary to adjust the hitch, p thing not yet possible with the electric yarder. Engineers of the company are t work on a whistle arrangement, worked by an electric relay, which can be adjusted to function when the load reaches a preactibed limit of safety

The advantages of the electric machine The advantages of the electric machine, where abundant power is available, armanifold. The electric motor as designed today, constitutes one of the most fool-proof machines in general use. With the use of electricity the problem of piping water long distances to the engine in climinated and the services of a fireman are dispensed with. Added to this comes a marked reduction in fire hazard.

The Return of Our Fleet

(Continued from page 33)

Grand Floet that it dare not leave its harbors. As a matter of fact we are told by Admiral Rodman that the fleet was on Admiral Rodman that the neet was constantly out in search of the enemy, and that small detachments were sent to cruse near the German bases, in the hope of luring the High Seas fleet into the open

But he would not venture out The fleet was frequently under attack

The fleet was frequently under attack by submatines. Says Admaria Rodman:
"In our operations in the North Sea we were frequently attacked by submarines, and our battleships had numerous narrow esseps, often only by prompt and sillful handling. On one occasion a submarine ranmed the flagship "New York," denied the bottom, and demolished the starboard propoller. But there as every reason to believe that the blows from the propeller sank the submarine. En route to drydock to make repairs and install a new drydook to make repairs and install a new drydook to make repairs and install a new propeller, three torpedoes in rapid suc-marines. But again she avoided them by elever maneuvring and escaped. Once when guarding or supporting a convoy of thirty or forty vessels, on the coast of Norway, in mid-winter, a bunch of hostile subs fired six torpedoes at us. Again only our vigilance and instantaneous maneuv ring saved us, but by a very narrow mar-gin. There were still other attacks by submarines which necessitated quick action

"It would be superfluous to go into the details of our operations in the North Sea, or to mention the rigorous climate, where the latitude is north of Sitks in Alaska, or about equal to that of Petrograd in Russia; or the terrific weather, the cold, sleet, snow ice and heavy sens; the arduous and dangerous navigation; the continuous cruising in close formation at high speeds, without lights, where the winter nights lasted 18 hours. Or the dangers of mine fields, our own sometimes, as well as those of the enemy; or the repeated attacks of hostile submarines on our battleships, and the submarines on our battleships, and the never-ending readiness and vigilance of the whole fleet to put to see on all but instant notice.

Always Ready to Fight

et it be sufficient to say that durin our absence of a year there was no other condition than that of constant and continuous readiness for action. There was no liberty or leave worth mentioning; no one allowed away from the ships after one allowed away from the ships after dark, nor for a period longer than four hours, and then only in the immediate vicinity of the ship, in signal or telephone one now the machine as a sendency to vicinity of the ship, in signal or telephone in limit of the ship in signal or telephone or it is all off the ground. A few turns of commission, subject to result. All monitors log or tree solves the question of the solves the question of the control of the solves and the solves are controlled. Another contrivance, as yet lacking on the solvest parket, in a overthead warning selected parket, in a overthead warning selected parket, in a overthead warning selected parket in the solvest parket solves are solved to the solvest parket solves and the solvest parket sol NOT Chance!—High reputation is never the result of chance. Underneath it you will always find the rock-hewn foundation of real worth. In the case of KEYSTONE COPPER STEEL, its high standing has been fairly earned—and has followed as the result of undeniable superiority in actual service.

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ener if

Let me add that with all of the demands which have been placed upon the ships of this division in spite of this constant trik division in spite of this constant readiness for action their maintenance, upkeep and officers under war con-ditions with no general overhaul or re-pairs have been maintained at such a high gr c that it is no exaggeration to that were they called upon to do so, they all all attach around the world as they are

now and still be ready to go into action now and still be ready to go into acrom
Ren zzi + the absolute necessity of
lol ling tl German flet innocuous within
its karbors Great Britain made vast additions te her fleet and rounded it out in every branch of its activity Rodman refers to this fact as follows

Io give an idea of the immense size and number of vessels employed in the Grand Fleet it might be of interest here Grand Fleet it might be of interest necestate that catering or leaving port, our column of ships excluding destroyers, was on an average about sixty five miles long, on one occasion 76 miles. Its length was on one occasion 76 miles Its length was dependent upon weather and other con-ditions as well as upon the number of

slips

If the whole destroyer fleet had been in single column astern the total line would have approached 200 miles in length

Ul natriotic and broadminded Americans will be pleased to know that our officers and men who have cooperated with the to the cordial sympathy and high apprecaation which chara terized the attitude of ation which contractined the attitude of our great Ally during the combined oper-ations. I estimony to this effect was given at a dinner on the New York in honor of Admiral Beatty whilin Admiral Rodman

It is truly impossible for me to expres officers of the Grand Heet the pride and officers of the Grand Heet the price and honor which I and my follow countrymen of the 6th Battle Squadron feel for the great privilege which has been granted us of serving for the last year as an integral part of your force under our most efficient genial and well tried Commander in-Chief, and with the others of the British Navy

it is needless for me to resterate that which is known and recognized throughout the civilized world namely that it is the ackbone of the structure which has mad a victorious peace a certainty Without it the war would long ago have been disastrously concluded with just the rivers conditious obtaining from those which now exist.

In addition to indisputably emphasis ing the value and necessity of sea power and the command of the sea the greatest less on which this war has brought home to us is that though we may have been born under different flags and are secredited as belonging to different nations yet these are more a matter of geographic boundary or delineation than of real or important or delineation than of real of important differences and that after all the same blood flows through our veins. We have the same ideals of rights morals, and national blorty and that when the time came to show this to our common enemy, we could not only unite under a sing leadership but could coordinate and o perite amouthly easily pleasantly, with-out the slightest friction and yet have an effected and well adjusted force, ready for any emergency or duty which it impht be called upon to perform

i shall always look upon the year spent in the Grand Heet not only as one of the most profitable but particularly as one of the most pleasant and agreeable of a lifetime and can only ascribe is to the a lindum and can only ascrose as to tose will order develop a variance man instead never ending outcome he had seasistance, of losing his temper and firing him which you our Commanded-in-Chief, and if you are a learner, strive to attend their flag officery, one and all, were ever to be ready to extend to us, parturdistry in the oughly rips, if an employer, take the opening, when we were more or less "third week" into accounts and help the never ending courtes; help and assistance, which you our Commander-in-Chief, and other flag officers, one and all, were ever ready to extend to us, particularly in the strangers to you and your ways, but who, green man

every one seemed happy and contented, if you feel as I do, have become more like and all eager to go to see every time the true and well-truef friends, or even as occasion demanded in the hopes that brothers between whom I trust and believe would most the Hun fleet and en-that the intimacy and affection which has that the intimacy and affection which has been engendered by our mutual association and common cause will last forever afterward

The Crucial Week for the Green Employee

MEN often get discouraged and quit the first month on a new job and do not analyse the cause of their failure. Thus article aims to discuss one universal reason article aims to discuss one universal reason for discouragement and failure in com-mercial and industrial life. A green man often labels himself as "Incompetent because he doesn't understand the nervous readjustment that accompanies any change of occupation, nor does he foresee the crucial moments in this readjustment

Every man in every occupation makes mistakes at the start. This is nothing to his discredit providing lie has profited by them and rearranges his mode of conduct so as to prevent the same mistake twice The man higher up always extends the privilege of making one mistake but wee to the man who continues to repeat it Repeated blundering soon catalogues an employee as incompetent and he is fired or is relegated to some niche of medicere service where his mistakes are not costly

However every man has had a week dead wrong If they all had backbons enough to stick in spite of it this dis-cussion would miss fire but thousands quit—only to swell our vast American efficiency in every occupation there shout the third week that is unques tionably critical?

The routine of new work necessitates the formation of new habits The process of habit formation is as cenentially physic logical as any other function of our ma logical as any other function of our ma-ternal bodies. It lies its basis in the most highly organized mechanism of man—the nervous system. The sense organs, com-ing in contact with the world about us ing in contact with the world about us receive impressions. These impressions are transmitted to nerve centers in the brain or spinal cord and action results. If the message transferred is dependent on the brain for interpretation, the process is conscious if the process is reflex, a lower brain center perhaps the spinal cord handles it with no thought on our part To form a habit is to transfer the circuit to a lower brain center and relieve the higher mental faculties for new work transfer takes place after the same pathway meets no resistance when it excites the

Nervous tissue is very plastic and readily yields to repeated stimulation. But from the time we start to form a habit until it is bsolutely part and pare there are dangerous pitfalls for the indi-vidual. The most critical time is when we must judge whether or not we can trust the lower nerve centers to carry out our work Too much new stimulus forces us to crowd unripe habits into the subordinate centers of control What happens? function inefficiently we make mistakes call these new habits back to consciousn

confusion results and we get discouraged Learning to operate a typewriter, adding machine a lathe a crane, or any-thing else means not only one readjust-ment but thousands—hence the significance of the problem We must not try to let our new habits do the work before they are grown up If an employee can gross this plateau of uncertainty in forming new habits, the battle is half won. If an employer can understand the stress and strain of this period for the employee, he will often develop a valuable man instead

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THAT is the duty of axle and shaft in actual services.

Within that great truck there are ball bearings that carry all the strain of the shaft and all the load of the axle—yet they have the added duty of reducing friction

That Hess Bright Ball Bearings serve this way under such conditions makes them standard. And it s safe to say that with a record in such service they will perform as consistently and with as little attention where the load is lighter and strain is less—as on your car

Rugged in strength precise in manufacture, yet certain of performance in gruelling service. That a the testimonist of their worth to you.

THL HESS BRIGHT MANUFACTURING COMPANY
PHILADELPHIA, PA.

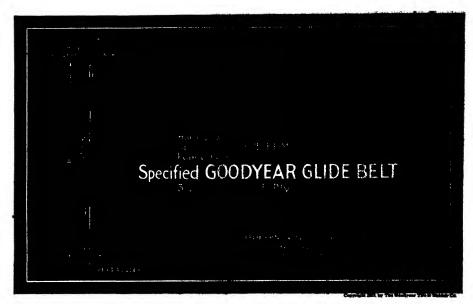
Where Performance

SCIENTIFICAMERICAN



Partie Co.

Price 10 Conts \$5.00 a Year



Fourteen Months-Half-Hour Shifts-and the G.T.M.

They had never kept belt records in the Kentucky River Mills at Frankfort, Kentucky They always bought expenses belts and took the price as proof of quality. They were troubled sometimes by the frequent need for belt repairs, by their belting bills and by low production—but they just accepted all these things as necessary evils. One July day in 1917 a C.T. M.— Goodyear Technical Man—called It was our Mr Jenkins.

He asked Mr Sutherland, the superintendent, to show him the hardest drive in this particular mill Mr Sutherland wanted to know why The GT M explained the Goodyear plan of selling belts only after a careful analysis of the drives to be served—and not as if a given belt were like a patent medicine and a supercure for any and all lills that drives may entail.

The idea appealed and he was shown the spinning frame drivalt was a shift every half hour the belt was thrown from one driven pulley to its twin. There was one quarter turn and one half turn. He measured belt speed centers pulley diameters and pulley faces, asked about the power and noted the nature of the lead.

Then he prescribed a Goodyear Glide Belt—3½ inch 5 pign.

Mr Sutherland was interested. He asked the price. He found it

was so moderate that he doubted the merit of the belt, but consented to try st. He didn't see where he could lose anything and he might be able to get rid of constant interruptions and shut-downs.

The belt was applied August 16, 1917, and is still running.

Its edges are not seen seen. No stretch has had to be taken out.

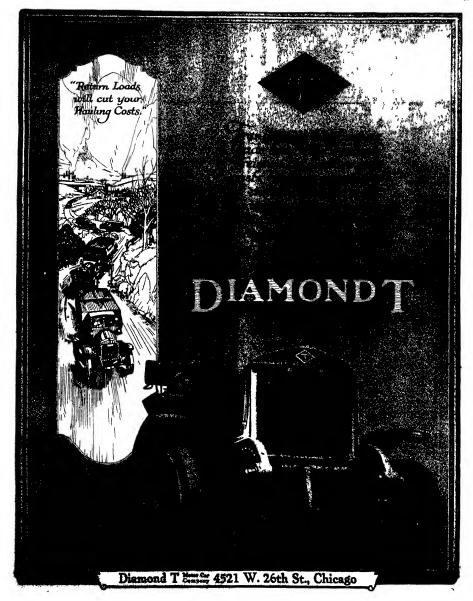
Production has never been interrupted a single minute. Four-teen months after being applied the belt seemed still as good as new

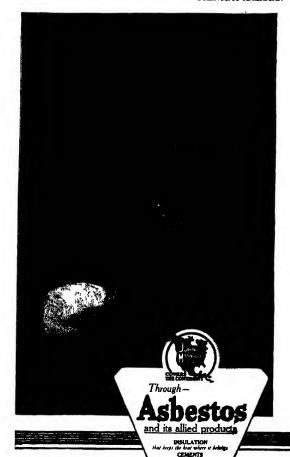
These fourteen months of perfect service, in spite of shifts every half hour on that spinning frame drive, have convected them to the Goodyear plan of beit buying—and to Goodyear Belts. They have made the mill a Goodyear-halted—and G.T M-served mill—his thousands of others.

If you have a hard drive, and have always accepted high beling costs and belt-troubles as necessary svils, sak a G. T. M. to call. One from the nearest Goodyear Branch will be gied to deso when next he is in your vicinity. His servace is free-for the savings he effects for purchasers are so awident and masserial, that a gratifying volume from the plants served is seen to result within a few years.

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO







You can thank these men for some of the coal in your bin

DRECIOUS black diamonds ! . . How we appreciate them since our experiences of last winter. . . .

But few of us realize how science is saving coal for us. We know little of the engineers who have devoted a lifetime of study to successful methods of saving steam and heat: who, through the insulation of piping and other hot surfaces, have worked out great economies in industry.

Not only plant owners but the Government steelf realizes what these men have done. During the last year the Fuel Administration has constantly emphasized in its Industrial work the tremendous importance of proper insulation. And as a result it is estimated that among our mills, factories and power plants over two and a half million tons of coal have been sayed.

And these savings will continue throughout the years to come More will be added to them. For coal wastes of ten years ago will never be tolerated again.

So, for some of the coal in your bin now and in the years to come you can thank, among others, Johns-Manville, who through their laboratory experimenters, by the development and application of asbestos, have perfected methods of heat insulation

And this development of a complete line of insulation has enabled this organization to build up a broader service in heat and power saving than would be possible were that service controlled and centered merely on the sale of any one type of covering Just another way in which Johns-Manville serves, not only industry, but the whole nation.

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories - Branchen in 63 Large Cities

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SEVENTY-FIFTH YEAR (1997) (1997) (1997) (1997)

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOI UME CXX.

NEW YORK, JANUARY 18, 1919

10 CENTS A COPY

An Ingenious Irrigation Scheme

A NEW ZEALAND engineering concern recently conducted an interesting proceeding in the hawarau Gorge, where two pullars had been constructed for the purpose of damning back the water Lach of the pullars is built of reinforced concrete. The column on the right-hand side of the river was

46 feet high and 16 feet square and weighed 720 tons, that on the left-hand side stood 36 feet high and 13 feet square, and weighed 530 tons The spot on the Kawarau where the river is to be dammed back is about to be dammed back as about four and a half miles from its junction with the Clutha at Cromwell, and a few hundred yards inside the entrance to the gorge. The river here is very rapid and asrrow, running at the rate of 300 feet per minute. The hanks are very attern. of 300 feet per minute.
The banks are very steep, and the tops of the pillars were not on a level with their edges. The works undertaken by the Development Company necessitated the rausing of the river. so that even at its river, so that even at its lowest flow it would be high enough to run into the in-

enough to run into the in-take on the right-hand side, and thence flow down a race to the power-house. It was not considered possible to undertake the building of a warr in the suus if fashion, owing to the precipitous nature of the sides of the gorge and the great volume of water, which has a fairly uniform depth of 17 feet. On the pressure of an electric button the gelignito answered at once to the firing of the charge. The huge

mass appeared to apring for-ward and lean slightly over as a tremor ran through its length Momentarily it bung in the air, and then slowly bent and fell with a mighty crash into the river, the spray rising to a height of about 60 feet From the time the explosion occurred till the piliar struck the water was just nine seconds The pillar appeared to give a roll when it again came to view, and the water of the river surged back and then quickly re-sumed its onward flow, cover-The ing the obstruction The pillar had apparently leapt out from its base as the ex-plosion occurred, leaving a gap between its lower end and the bank of about 20 feet. When it came to rest and when the pillar had finally settled, it was seen that it was lying in a diagonal position, its top facing

company's engi to company angular, in being interviewed after a falling of the first piller, present his satisfattion at a way in which it had come and constitution to a part of the piles. which be had allowed for it Since the pillar had fallen the river had risen d feet. It was lying just under the water The intention was to back it up with 1000 tons of mea schiat I has bl ching it was anticipated would sit up finally with sand u d the whole of the river would flow over the obstruction at a sufficient height to

Two monoliths ready for the expl



The concrete pillar toppling into the river

run comfortably into the intake The river being thus raised, the flurang which is built for a distance of 30 chains on the right bank will be available to carry the water to the turbines which are to force the water from the river to a height of 180 feet through 2 240 feet of 30-linch pipes, and thus irrigat's an extensive plantation

Forest Fires of Spontaneous Origin

T is usually assumed that forest fires when not the I result of a strol e of lightning are the result of care-lessness on the part of lumbermen campers picknickers iessness on the part of lumor min campus picknessers or wayfarts A I ruch secontat, Mr G Raymond, demes this and of its several interesting hypotheses in a brief article in La Nature (Parus) to account for spon-

taneous fires He notes first that such fires always occur under the same conoccur under the same conditions, namely, when the weather is dry, hot and windy, as for example, during the blowing of the 'mistral' in southern Europe To begin with, he considers it entirely possible that the dry and possible that the dry and resinous branches of a pine forest might develop enough friction in a high hot wind to strike fire, the case being analogous to the method in which various savages ob-tain fire by a "fire stick" Again, minute drops of resin spherical in form, might act as leases to bring the sun s rays to a focus, thus setting fire to the in-flammable materials around

A third suggestion is that since the ground of a pine forest, covered with needles

and other decomposing matter, ofton acquires a very high degree of heat in the summer months, even a temperature several degrees above 100° F, there may result catalytic (flects in the presence of impalpable resinous

Lastly Mr Raymond considers the effect of a possible nsiders the elect of a possible engendering of frictional elec-tricity in scraps of bark, pine needles, etc, driven hither and thither by the wind It is indeed, a well known fact, that in the right known fact, that in the right weather condutons many per-sons can light a gas jet merely by pointing a finger at it, after shuffing rapidly over the carpet so as to develop a large amount of electricity through friction Similarly the mere shaking of a blanket in the Sabara often causes it to mit a shower of sparks Apropos of this the African explorer, Foureau, often mentioned the fact that during the blowing of the smoom in the desert his amoon in the deart his ponket compass was rendered utterly unreliable by reacon of the electricity developed in its glass cover by the friction of the rand against it, driven before the burning wind Soit appears minerally reasonable to conclude that some, at least of our forest first may be attributed to such causes as these, and that locomotives and emippers and lumbermen my be acquitted of universal responsibility



One of the fallon pillers in the water. Note the intake on the right

SCIENTIFIC AMERICAN

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The I liter is glid to have submitted to him timely II In untible for these colurns especially when such the laure i importell; plet griphs

To the Secretary of the Navy

N the Sen Stiffe American of December 28th 1918 we made known the very gratifying fact that with th chrimation of the German Navy the United States N 13 3 moved up to second place. We showed also that because our allies lost many of their capital ships and stopped work during the war, upon those they we building our navy is so strong a second that it is equal in dreadnought strength to the next three navies those of Linin Trance and Italy combined

Our investigation showed that the United States possesses 19 dreadnoughts Japan 9 1 rance 7 and Italy 5 We found also that because of the superior gun power ermor protection and displacement of our vessels our 19 ships were fully a mutch for the 21 ships of the three powers enumerated

Our total of 19 completed I mited States dreadnoughts was based on a recent statement of the Chief Constructor to a Congressional Committee that we possessed that number As a matter of fact the Idahe is compicted but has not yet had her trials and the Califorms and Ichnesce are nearing completion and will be finished by the summer. It is fairly certain that all three ships will be ready for service by the time the Peare Plenipotentiaries have affixed their signatures at Versaulles

We are addressing this open letter to you sir, because we feel that you owe it to Congress and the American people to explain why you presented to the House Naval Affairs Committee and allowed to be published in the New York Times the misleading statement of the naval strength of the Allies which appeared in the issue of that journal of December 31st 1918. In the table presented which we analyse on another page you group the completed capital ships under three beads, viz, Battleships Older Battleships and Obsolete Battle-ships and because under the first heading. Battleships you assign 16 to the United States (this being the number of our completed dreadnoughts at the signing of the armistice) it is evident that you intend the American people to understand that the numbers assigned under that same heading to the respective navies of Great Britain I rance and Italy represent the number of completed dreadnoughts possessed by those nations

As the result of your treatment of the statistics the ountry is led to believe that Great Britain has 61 dreadnought battleships completed I raise 20 and Italy 14 whereas the truth is that Great Britain has only 33 France 7 and Italy 5 No that in your effort to convince the taxpayers of the country and their representatives in Congress that our navy is inadequate you give the correct figure for the dreadnought strength of the United States Navy and exaggerated figures for the would make them believe the British dreadnought strength to be about double what it is, and the strength of France and Italy about treble

Now, air, we have a profound respect for the exalted and difficult position which you occupy in these persions tunes, and we naturally and loyally jumped to the conclusion that these glaring errors were merely a slip of So we sought for an explanation of 61 being given as the total of the British dreadnoughts and found that it included the 21 predreadnoughts, or "older" battleships as you call them in your table, and even the 7 obsolete battleships of that navy Now if we add 21 and 7 to 33 (the actual number of dreadnoughts) we arrive at your total of 61. Similarly, we find that Italy has 9 predreadnoughts, which number added to her &

desadnoughts gives us your total of 14

We go thus into detail so that you may understand
our perplexity, for it is evident that you had the full data before you in all its detail, not merely of our own navs, but of those of our allies, and what we are asking ourselves, and what the House Naval Affairs Committee and the country at large will not understand is why the becretary of the Navy should give the true totals in regard to our own navy and incorrect totals as to the navies of our allies

What the American people, naturally want to know is if a battleship is obsolete or old in our navy, why is its counterpart not obsolete or old in the navies of our If Italy has 14 battleships France 20 and Great Britain 61, by the same reckoning the United States has Why, Mr Secretary, do you thus confuse the usue by conveying the impression that 16 and not 30 represents the relative standing of the United States?

With the exception, possibly, of a few of the office with whom you have surrounded yourself at Washington, we find that there is a practically unanimous conviction that the strength of the British Navy is warranted by her island position and the scattered condition of the British Empire, and that it is sufficient that we should be a powerful second Particularly strong is this conviction among the officers of the battle squadron which

Theodore Rossevelt

THE SCIENTIFIC AMERICAN washes to lay I a wreath of mourning at the feet of the great man who has just passed away While he lived, his passionate and fearless nature made him a host of passionate and Justless nature made him a nost of friends and some enimets, but in this time of sorrow all alike, whether they are friends or fore, Republican or Democrats, so him the desire to pay tristate to the man who was regarded as the first American Citizen-and whose laying and patrictim were like and statement to the control of the con-trol of the control of the control of worms, when the control to backless of gooding five tries geariessness and naired of wrong-doing, combined with his fundamental loseliness of nature, endeared him to the generation in which he lived, and will be an inspiration to those which are

you recently reviewed on its return from cooperation with the British fleet in the North Sca

If there is any body of expert opinion that is qualified to judge whether the British fleet is a menace to the peace of the world, it is to be found surely among these American officers, who have spent a whole year with that fleet in the most intimate intercourse and cooperation They frankly express their conviction that the British Navy is regarded both by officers and civilians of Great Britain as a purely protective force, built up and maintained for the sole purpose of keeping open the trade routes between Great Britain and her widely-scat-

Furthermore, the suggestion that the German fleet be sunk was prompted by the belief that an era of retrenchment for all navies, including our own and Great Britain s, was at hand The climination of the German fleet was regarded as the first logical step in this direction

That this suggestion should have originated, as Admiral Rodman has announced, with himself and Admiral Beatty at the German surrender, proves that the thought and desire for retrenchment were already in the air

Now that the public has been made aware of this fact, you will perhaps understand Mr Scoretary, that your persistent advocacy, even before the peace conference has opened, of huge increases in the United States Navy has filled all thoughtful people, not merely among our allies, but here in America, with amazement and deepseated concern

This note of deep concern is sounded in an editorial on your attitude, in the Washington Post of January 3d, which says No patriotic citizen wishes to hear any language at this time, or at any time, which is in its ence a manifestation of distrust of and latent enmity

to one or more of the nations that have fought side by side with the United States against Germany. Yet his utterances along these lines, at a time when Pressie Wilson is straining every nerve to show the Affice that the United States sympathines with them, and is anxious to have them all adjust their interests to the common welfare and peace of the world

Reconstruction-With American Machinery

RIOR to the war, the big manufacturing pro in this country was to reduce the cost of the finished product by means of labor-saving devices for in American goods the cost of labor is always the outstanding item In Europe, on the other hand, where labor has constituted a relatively small percentage of total costs, the installation of expansive labor-saving American machines has never met with much encou agement It was the old story of the farmer and his hogs A silvery-tongued agent had spent a couple of hours trying to sell a wonderful new feeder, which enabled the porkers to get outside a square meal in about one-tenth the time required when it was necessary for them to fight one another back and forth along the trough When he had shot the boit of his electiones his prospective customer remarked, "Waal, I don't guess my hogs time is worth much money

But the war has completely changed the conditions that surround the employer of Europe an labor As a special writer in the New York Evening Post recently pointed out, probably at no time in the history of our relations with Europe has American labor-saving ma-chinery been in such demand as in the present period of reconstruction, European labor conditions, so far as wages are concerned, now more nearly approximate those of the United States than ever before. Already, numerous American makers of machinery who are properly protected in Europe have, within his knowledge, been approached by English and French manufacturer asking them either to ship machinery or to arrange for licenses under their existing European patents

Europe, before the war, did not know what we meant when we talked of quantity production But today new American machines are to be seen all over Great B and, hi less degree, France More important even than this are the American ideas that have taken root-ideas about the layout of machines in factories, ideas about the efficient using of unskilled labor through skilled planning ideas of scientific management of all kinds The great loss of labor through the war alone would snake it essential for the European manufacturer and the European agriculturist to increase their per capital production It is this necessity that is creating a demand for American inventions in Europe, for this country is the headquarters to which other nations must look for inventive development along labor-saving lines

The meaning of this to us must not be overlooked In the first place, it gives great promise of helping the solution of our own reconstruction problems have to do, not with finding enough labor to go around, but rather with the most advantageous employment of the labor which the war will release, and of the manufacturing facilities, multiplied even beyond our normal huge capacity, which it has bequeathed us Our contemporary displays keen vision in its clear view of the possibilities here—possibilities whose importance is but suggested by the fact that already our manufacturers are crying aloud, through these columns and elsewhere for peace-time products to keep their plants busy

The situation has its call to the inventor, too It were utter folly to suppose that labor-saving machinery has attained the height of its possibilities. In every direction it can be improved, in many industries it has not even een introduced save on the smallest of scales. For the inventor who can seize this opportunity and for the manufacturer who will sense it in company with him, the business of developing machinery for us to make and sell to Europe offers extraordinary allurements

To Our Subscribers

OUR subscribers are requested to note the expiration date that appears on the wapper in which they receive their copies of SCHENTIFIC AMBRICAN. If they receive their appears on one wrepper as wmen receive their copies of Scunyrays Assumators. If a will send in their receival orders at least two weeks p to the date of expiration, it will nid un grapely in dering them efficient service.

Engineering

The World's Record for Car Movement is claimed by Columbia, Pa., where according to a recent report of the Drestor General of Railroads, 9,331 cars passed in a single day. In one month 289,000 freight care passed Calumbia, or an averses of six cars for minute.

Gas Producer Built of Concrets Staves.—Owing to the high price and exceedy of steed during the war, a gas company in Syrasuses fortind it is necessary to build the shells of a 200 horse-power gas producer and scrubber out of concrets staves. The shells are eight joint in diameter and the staves measure 34 by 10 by 3-16 inches. They are connected by tongue and groove points Beween the concrete and the fire brick immy there is a three-tunk spece filled with a bear resusting maternal

The Largest Tanker.—What is said to be the largest oil staker in the world was launched at Walland-ou-Tyme last month. The vessel has a length of 506 foot and a width at 68 feet 7 inches with a moided depth of 426 feet and 1 lakerwood system of longitudinal framing and was measured to pesse both the Panama and Bises Canals. The ship's hull-is divided into 13 compartments, and has 4½ mitted of pipper. It is equipped with steam heating apparatus, a refrigerating plant, a hospital and a complete installation of surgitary meaheary. Compound geared turbines are used which may be run independently or be coupled to gearing to draw the proper the stallation of surgitary meaheary. Compound geared turbines are used which may be run independently or be coupled to gearing to draw the propeller.

Caterpillar Road Grader in the Desert .- We have referred before, in this column, to the 17-mile tangent of Lincoln Highway which cuts across the Salt Lake Desert shortening the highway by some fifty miles I his road is being built with desert soil as a base on which is laid a base course of gravel 5 inches thick with a surface course 3 inches thick The descriptions is broken up by means of gang plows and shaped by means of road graders, by naterpillar tractors Owing to the nature of the soil some difficulty was experienced in moist weather due to the weight of the tractors which sank into the mud despite their broad bearing surfaces. The difficulty was solved by bolting tumbers to the caterpillar belts so as to broaden the tread of the machines. As the road bed is completed the gravel is hauled and dumped over it by means of motor trucks mounted on broad steel-tired wheels which serve to pack the road material

Halping the Salvor in the Shipyard—When the roce between the submarule and the shipyard was at its bright it did not seem to notur to anyone that special postulan should be made in the construction of a ship to sender it easier for earlyon to rease the ship it asset should be made. The submarune minner is now part, but awan in me of jeases, there is considerable loss of vessels due to the sements, and to collision. One of the greatest difficulties that wrecking companies have to contend with it that of getting hold of a vessel which is completely as thought of young to the construction of a shap it in necessary to pass chains under it at venous points as there is no provision for stateshing chains directly to the fraums of the shap Wity are not contained with shacking afficient to the fraum members at suitable points so as to simplify and expedite a work of the diver in making chains of called fast to a

Repairing a Wooden Ship with Concrets—A letter from Bance Aires addressed to Engineering (London), describes some interesting work done in the repair of a wooden ship. The venes, which is of 200 tons displacement, was purchased for the transport of stone and man. On dumping stones into the vowel it was found that the bottom was weakened by the fraspect and inside beight Investagation showed that the wooden riba had estirely rotted away for some three fact on riba and estirely rotted away for some three fact on riba and estirely rotted away for some three fact on side was a supplied to the total the wooden riba had estirely rotted away for some three fact on sides edge of the keet The bottom, however, was in good condition. Owing to the condition of the boat it was padged that it could not be decided by remained as the kines. In this encoughor; have ribe of relationed concrete were fitted into the spoos between the wooden ribe and at the kines time ther fashe look was terms phomed by remaining spectaments occupied prices on siber side of it. The words was done in Reful conclidation. The speat gives every evaciance of things a apparent. The congrete adds very little more weight blass, the leadest of did chains which had haveto-fore been quite in the vened

Astronomy

Bright Night Skies in Engiand—The report of the Photographic Section of the Brutah Astronomical Association for the year ending September 30th, 1918, comments on the unusual amount of light in the sky during the nights of that period. It has says the report been peachle to read the face of a watch at all sorts of hours. The contrast of astronomical regatives has been much reduced. This illumination was not due to searchlights, nor did it seem to be aur rail moreover, lighting in towas has been much reduced under war regulations, so the cause remains a myster.

New Ideas in Astronomical Observing.—A committee of the British Astronom of Association is known as the "Methods of Observation Nection This body is trying to make as large collection we possible of special devices and methods that members have found useful in these work, whether in actual observations or in the setting up and adjustment of instruments 1 like director, Mr Maurine A A risk! S Woodville Road Blackheath, London, St. I. would doubtless welcome suggestions from non-members asis as to useful dodges. He proposes to publish short! Information is especially deer in the state of points on which information is especially deer.

The Total Solar Eclipse of May 29th, 1919, will be comparable with the edip so flat summer in the long atretch of continental territory covered by the path the track extends across-bound police as long the path. The track extends across-bound among a to summer widest part, and also across-cquatorial Africa. The duration of totality will be ex. 1 ton illy long (ext seconds or more). The Carages P by partition to ferrestrial Magnetism, Washington is pluning to sind two expeditions to favorable points. In director Dr. L. A Bauer, washes to hear from oil or institutions planning expeditions, in order that arrain, ments may be made for systematic observations in terrestrial magnetism at mosphere electricity, and kim for distances of the clipse

Variations of Mira Ceti Surveil recent series of observations of the varying intuitions of Mira Ceti secompanied by light-curve are published in I 4 streams for last October M 1 this diety the Bidgian startmomer places its last in visuoum at October 2d 1017, with a brightness of 34 mag on the Havaid scale. The previous maximum was November 5th, 1916. The last maximum idd not be observed on account of the proximity of the star to the sum. The increase from mainimum to m visit in was regular and very rapid the subsequent of see see single by other observers to the recent maximum ring from October 15th. The data 1st visuously rakulated was October 21st.

A Short Period Variable Star in Andromeda—
Mas F Mabel Ashall a graduit studint of the University of Toronto, has re nith decovered a variable star in Andromeda R 4 2. h 19 in Ded N 17 deg 22 m, having the remarkall is short; crod of 3 h 50 in 55 i s. The range of vari tons is small being only from about 9 18 to 9 88 in g. This variable was decovered in the examination of a nimber of plates from Harvard College Observator; and a further examination of plates, extending over a period of 26 years made by Miss H 8 Lowyth has re-celed the fact that during 1918 the period of variability changed suddenly becoming longer by 0.17 sec. The light curve above a gradual decline in brightness and a similar graduit measurement.

The Twenty-accord Meeting of the American Astronomical Society was held at Harvard Coiege Observatory August 20th-24d with an atjeudance of about fifty The programme of papers was immusally large, and a considerable number of those deaft with the solar exlipte of last June and the new star in Aquia An active discussion took place over the question now preminent in the astronomical world of the time of beginning of the astronomical world of the time of beginning of the astronomical world of the time of beginning the satronomical world of the time of beginning the satronomical poth at midnight and numbering the hours from 0 to 24 A similar resolution has been adopted by the Royal Astronomical Society, and the project is favored by the British and French navel authorities no the prospects are that the long-mooted referent in time/corping will soon be put into effect. Fird E C Pickering was elected president of the society for the occurs proving was elected president of the society for the occurs proving the coloning year.

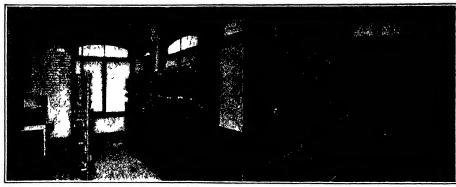
Automobile

Post-War Models in England — There is consider able speculistion in England as to what kind of irrival be offered by the manufacturer now the war is ended for it is a generally accepted fact but the lagners of that rountry have been making careful note 1 to operation of all kinds of earn used by the arranes with a view to future radical changes and improvement a view to future radical changes and improvement work under the last impute and not yet free will hack at that all of the car builders were full up with government work until the last impute and not yet free will inske at impossible to get out any new models for this sous in and the real post-war car is not expected to make its appearance until next fall. Practically the same manufacturing conditions prevail in this country, but no such radical changes in models have but in pedicted here as are rumored for the British makes.

Rubber Water Connections - When cleaning out the radiator it is well to occasionally inspect the condition of the rubber hose connections in the water circula tion system for obstructions not infrequently develop at these places. If a giveenne anti-freezing mixture has been used or any kind of radiator dope, the interior of these rubber connections is very likely to be injured as many of these substances so affect rubber that the interior surface of the connection is softened and loosened and the vibration of the car is liable to cause pieces of rubber to break away When this occurs the loose pieces lodge at the narrow points in the passages and scriously diminish the flow of the cooling water ever one of these rubber connections feels soft and flabby or appears to have breaks in the body of the tubing, the connection should be removed and care fully examined and at the same time the passage should be tested to we that the flow of water is not obstructed

Care of Radiators -Out of sight out of mind is a saying as old as the hills, and as true today as it ever was and it is particularly applicable to the car radiator No one over sees the inside of the radiator and conse quently as long as the outside looks well and there are no terious leaks it is taken for granted that the device is all right and performing its function properly Some kinds of water form a deposit in the radiator and water passages and this is all the greater if the water used is dirty with the result that the circulation is retarded and the engine runs hotter than it should. As the radiating surface is designed in suitable proportion to the size of the engine in order to maintain proper operation the radiating surface must be kept in efficient condition and this means the inside as well as the outside A satisfactory way to clean out the deposits within the radiator is to make up a solution of one pound of washing soda in two gallons of hot water. This is poured into the radiator which is then filled up with plain water and the engine is then run slowly for half an hour, when the soda solution is entirely drained off and the radiator refilled with clean water. This cleaning out should be done several times a year and more particularly where the thermo-siphon system is used

Anti Freezing Mixtures -During the winter season eat care must be observed to keep the cooling system of an automobile from freezing, and to assist in this many anti-freezing mixtures have been offered to owners of cars The U S Bureau of Standards has made an exhaustive investigation of the subject, and its conclusion is that the most satisfactory material to use which will not injure either the radiator engine or the rubber connections is alcohol mixed with the cooling water in sufficient quantity. For a temperature of 27° F a 10 per cent solution of alcohol is required for 10° I' per cent, for -2° F, 40 per cent and for -18° F a 50 per cent solution The best way to make up the proper strength mixture is to use an hydrometer and the specific gravities shown by the instrument for the above temperatures are respectively 0.988 0.968, 0.957 and 0943 Of course the alrohol boils off quite rapidly, and the cooling medium must be tested and more alcohol added every few days but it appears to be the only safe system Glycerine is sometimes added to reduce the loss of alcohol, but in effective quantities it attacks the rubber connections seriously and calcium chloride solutions, so often recommended are decidedly corrosive especially on the soldered joints of the radiator and on aluminum or alloys that are often used in manifolds, pumps, etc



General view of the multiplex at paratus now used between Baltimore and Pittsbi n apparatus now used between Saltimore and Pitteburgh
Two views of the multiplex racks with covers ret
Two views of the multiplex apparatus now employed for increasing the carrying capacity of telephone lines

Getting More Messages Over Our Wires

How the Traffic Capacity of Telegraph and Telephone Circuits Has Been Increased Three-fold

THF new system of multiplex telephony and telegraphy recently announced in the daily press is the result of soveral years of intense offert. By its application it of soveral years of intense enter 133 its application it is now possible to increase many fold the message-carrying capacity of long distance telegraph and tel-phone lines indeed the new system marks an epoch in the development of trans continental communication

the development of trans contineintal communication. The new multiplex system which has been in actual use between Baltimore and Pittsburgh for more than two months with entirely satisfactory results is the recent practical application of the work of the technical staff of the Bill Organisation. If permits four telephone con versations to be carried on simultaneously over one pair of wires in addition to the telephone conversation provided by the ordinary methods. I hat means that over a single circuit a total of five telephone conversations are simultaneously transmitted and in each the service is as good as if the circuit were carrying in the ordinary way, a single conversation

A number of years ago the Bell engineers developed A number of wars ago the Bell sugmeers developed the 'phanion' curvuit arrangement by which telephone circuits are obtained from two pairs of wires and and has been extensively used but here tofore it has been impossible to carry over a single pair of wires more than one telephone conversation. Now it is possible by the multipex method to utilise many charge of barts for five conversations while two

pairs of wires which heretofore had a maximum of three conversations with the aid of the phantom may now be multiplexed to carry ten simultaneous conversations This amounts to an increase of more than three fold in the telephonic carrying capacity of the wices as compared with the best methods previously known to the art and an increase of five-fold in the capacity under conditions where the phantom circuit is not employed. The new multiplex system makes use of alternating

currents whose frequencies occupy a range b tween the frequencies of the ordinary telephone currents which are those of the human voice and the lowest frequencies which are used in wiseless communication. This frequency range has not introtofre been commercially used. It is interesting to note that under favorable used it is interesting to note that under favorable conditions the whole range is suddile to many and the lower part of the range is suddile to anyone with normal hearing it is found that frequencies within the range are high enough to be used as 'carriers of ordinary telephone currents and yet with proper arrangements telephone currents and yet with proper arrangements can be transmitted over long telephone lines without the large transmission losses and large interference between curcuits which would be it ught in by higher frequencies. Each additional curcuit in the new system makes use

Each additional circuit in the new system make size of some frequency within this range. At the sending end of each circuit the or linary telephone currents are made to modulate this 'carrier' frequency so that the amount of the "earlier" frequency art out on the line varies with the amphitude of the ordinary telephone current. At the receiving end the carrier current is put into a demodulating circuit which then gives out the original telephone current.

The different circuits are kept separate at each end by inserting in each circuit a combination of impedances which make up an electrical filter. This transmits which make up an electrical filter. This transmits the range of frequencies peculiar to that crown and stops all other frequencies. An important difference should be noted here between this system and writeless systems, in that in wireless working it has been generally sufficient to send and receive in "dignet circuits I he multi-plax systems, however, suned circuit would not be sufficient since each telephone channel occupies a range of frequencies of about 2,500 cycles and any circuit uned to these comparatively low frequencies would be too selective to receive such a range property.

vacuum tunes are used in the modulating and de-modulating currents and are also used as amplifiers in the transmitting and receiving branches and at inter-mediate points along the ime where necessary, in order to prevent the currents from becoming too highly at-

renutated The underlying principle may be illustrated by considering a composite photograph of five individuals. Given such a composite photograph of the ordinary size it would obviously be impleasable to derive from it the picture of each of the five individuals going to make it up in the owner of the composite photograph had been made in the composite photograph If however the composite photograph had been made up in five different colors, the picture of each individual up in New different colors, the picture of sach individual bung in different color, say, one ed one blue, one green, one yellow and one violet, it would then be possible by looking at the picture through colored glasses, to see any one picture, separate from the others if red glasses were used, the picture practice in red only would be seen, if blue glasses the picture in blue, and so on although when looking at it in the oglainary way all of the pictures would be seen together and only the combination would appear. As the tint of each picture serve as a means of differentiating if one has the other differentiating if one of the other differentiating if one of the delay of the color of

of the "carrier" currents serve to differentiate such of the conversation in the sew telephono multiplex. Sensational results have also been attained in telep-aphy by the new multiplex system A single pair of wires combined into a megaliic circuit of the type used for telephone working, by the appheation of the Bell Systems new apparatus and methods, will have an corrously increased expectly for telegraph messages. As applied to high speed printer systems, the organeers are the server of the system of the system of the server are the server of the system of the system of the system corrowed results are attained without in any way un-pairing the telegraph traffic.

pairing the telegraph traffic.

Moreover, the nature of the developments permits
the same wires to be used partly for telephone and partly
for telegraph purposes. This means that a pair of wires
as available either for a ve simultaneous telephone com-

as available either for We's multianeous telephone con-versations for 60 simultaneous telegraph messages, or partly for one and partly for the other. There have been aumberless attempts by inventors, scientists, and engineers, from the earliest days of both the telegraph and the telephone, to develop methods for

the multiplex transmission of messages Dr Alexander Graham Bell was working on the problem of multiplex telegraphy when he had his first conception of the structure of the original telephone I be significant that the Bell organisation which has been and is working con-tinuously to perfect the telephone and extend its useful-nees, has accomplished not only multiplex telephony but multiplex telegraphy, Dr Bell's unsolved problem Notwithstanding the fact that there were no on

clustedly practical results from the early efforts in this direction it is nevertheless true that some of the underdirection it is nevertheless true that some of the under-takings of the scrifer workers in this field have been of suggestive value at least in the working out of the prob-lem As an instance there is a suggestion made by Major General George O Squier, Chief Signal Ufficer of the U S Army, about ten years ago, which attracted very general attention Likewise, Dr. Lee DeForest working in entirely different fields and with a different

working in entirely different fields and with a different objective, a number of years ago, invented a wireless device known as the audion, which by the improvements and adaptation of the telephone engineers has been made an important part of the new system. Whate the new multiplex system is physically adaptable to short lines, practically, from the nature of the apparatus and methods employed, it is not advantageous on lines of much less than one hundred mides. On longer lines its application will be extended immediately, but its introduction must necessarily be gradual on account of the nature of the apparatus required and the rarrange-

its introduction must necessarily be gradual on account of the nature of the apparatus required and the rearrangement and salapiation of the lines themselves and thair associated apparatus to the new methods of working. The new multiplex system as it is now applied to the telephone as a means of increasing or multiplying transmitting capacity of long lines, requiring no change in the subscriber bisphone or in the terminal switch-board operation It is quite as applicable to transcribe the contract of the c

The "Eagle" Boots

The "Engle" Bests

THE Ford 'Earle" boats, of which we are hearing so much just now, were designed for sati-submarine service—work for which we have always considered as larger crist, and we believe that if nor services that it is not structors had had their way and been left estirely free in the matter, they also would have designed a larger boat with better sea-leeping qualities. How far lift Ford had to do with the design we do not know, but we do know that speed of construction was a controlling consideration. Remore the franking and the general insecunderation Remore the franking and the general insecundant working to a minimum. They bound a general working to a minimum. They bound a general working to a minimum. They would be in trouble driving into a head was or running before a following sea, in which latter case they would be very difficult to steer Ether the construction of any more of these boats should be a bathough of the design should be these boats should be a bathough of the design should be minimum.

What Machinery Is Doing for the Walnut Industry

How Production Is Enlarged, Prices Stabilized, and Wastes Eliminated

By Howard C Kegley

A FEW years ago when the English walnut growers of California formed a cooperature association and began marketing their own product they found a big obstacle in their way. That obstacle was the cull—the under-developed, discolored or scrawny nut. It stood in the way of standardisation of two coccilent grades. The people had been secusion it to walnuts at 10 cents per pound, and they couldn't so that any auti was worth more than that. Nut peddiers had been in the habit of buying up quantities of culls, topping them with a few high grade nuts and

promise, togenore them with a for onlying an quantous profiling the marced with them At the outset the growers' association decided that it would have to eliminate the cuil in order to prove to the public that there was something better—something worth at least 23 cents per pound 8 to the first year of scientific marketing the cuil was taken off the market 1 had previously been sold at about five cents per pound At the outset the association undertook to crack it and sell the meat for use in candy stores and bakeries. The going was a little slow and the cuils died a pan out profitably the first year but the first and second quality nots brought good processor.

areful study of conditions and requirements have at the outle business on a bigger scale, so the contracts were made to read that all gowers had to deliver their entire output of outle to the amount of their entire tuning taking the call out of the market. Fine members of the semiouslin intended their machines when the semiouslin intended their machines when the semiouslin intended their machines when the semiouslin intended their machines which did sway with hand-cracking, provided as match of separating the good nate from the bad once and finally made it possible to extract the last more of mast from the shell of the cracked culls.

of mast from the shells of the cracked culls. Today the walnut growers association has revolutionized its business to the point where it gets from 20 to 23 cents per pound for number ones and number twos, and sells its nut meats for from 2 to 45 cent per pound. And the singular thing about it is that it cannot get acough of the meat to supply the mand. This is due to the fact that the meat of the English walnut grown in the United States splumper and the supply the substitution of the self-should be supplyed to the substitution of the subst

English walant grown in the United States a plumper, ranger and whiter than that of the nuts grown in southern Californs whould meate completely enveloped the imported walant meates completely erowded the imported walant meates cut of the market in that country. The invention of the three machines used in transforming the cull into an article who is in big demand and it possible to use every bit of the cull for commercial purposes. In the packing houses of Chicago it is said that they extract from the pie overything but the squeal lith speciformance. Even the shells are sold, they are used in place of commend, as a carrying whole for dynamic and the association soils all of its oull shells at \$10 per ton. In the matter of winning



Vacuum machine that culls out the undersized nuts



This machine cracks but does not crush the nuts

the war it can be seen the English walnut has done its bit along with other products of the soil which are considered more vital in times of war

Trobably the most important of the mechanical mechanical advice most important of the mechanical machine—a divice invented by our of the association immbers and sold to the organization. It has a capacity of five tons of nuts per day and four of the machines keep 200 women and garlas twork separating the meats front in this file and grading the measts.

Ins machine has a nut hopper at the top. The nuts drop from holes in the bottom of the hopper into cylinder going in one at a time. He cylinders feed then one at a time in between long iron hingers. The finger device is operated by cam wheels. At one stage of the crucking operation the fingers are just far enough apart to admit a walnut with its end perpendicularly. When the walnut has dropped between the fingers until it fits anugly the cam wheels turn around to the point where their leverage aboves the right hand set of fingers over against the left hand set with a quick motion and that motion exerts just enough energy to snap the shells of the nuts without exercising any slow pressure which would tend to punch or crush the nuests. Then as the came in nover against the fingers are allowed to spread apart, and the nuts drop into sacks which are hung over the mouth of the chuts below the machine.

The adjustment of the machine is so nearly parfect that it cracks at least 55 per cent of the nuts without injuring the means in any way. The 15 per cent of damaged meats come from extra large or unshapely nuts which do not conform to the size of the space between the cracking fingers and consequently get too which returns the time meahing is in motion.

octiven the cracking angers and consequency get much squeeze when the machine is in motion.

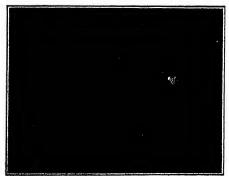
One of the laggest problems that confronted the association when it undertook to separate the culls from the high grade nuts was that of weeding out the high weight—the nuts with only one mature half, or those which had shriveled meats or moldy meats, or were otherwise unfit to go into the two best grades

It was necessary to eliminate these inferior nuts in order to establish firmly the quality of the better grades in the open market

This difficulty was overcome by the use of a vacuum machine invented for that particular purpose. The device works on the pimuple of the vacuum cleaner, and it life from among the high grade nuts all nuts which are light in weight and therefore of questionable quality. When it has finished its work the association is reasonably sure that every nut it has left in the two best grades is a sound nut with plump meat. The nuts are conveyed to the vacuum machine in

The nuts are conveyed to the vacuum machine in a narrow elevator at one side of the machine. The elevator belt is pooleted to keep the nuts from piling up and overflowing the elevator track. When they are dumped into a trough at the end of the elevator.

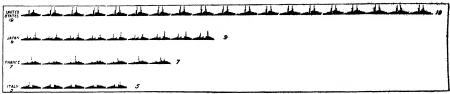
(Continued on page 62)



The gifts supprate must from shells, on the cracked nute pass out of the big



Feeding the shells into the machine which finds the small pieces of meat that the girls have everlooked —fifty dellars' worth a day



This sketch shows what will be the comparative strongth in dreadnoughts of the United States, Japas, France and Italy at the signing of the Versalius Peece Treaty, when our dreadnought fleet will be equal in power to those of the next three nations

Battleship Strength of the Five Leading Naval Powers

Analysis of the Standing of the Allied Navies in Dreadnoughts, Predreadnoughts and Battle-Cruisers

THE end of the world war finds the Allied powers war-weary and eager for relief from the burden of main taining huge armaments both on sea and land. Americans returning from the other side, whether they be officers of the army or navy or civilians tell us that all of our allies now that the Oceanan threat is gone are prepared to make a provata reduction of their armaments based upon their several national necessities and it is confidently believed that the determination of the relative future strength both on sea and

land, will be mutually and ameably ad

man, will be mutually and amarabll ad justed at the forthcoming is a conference in 1914 the leading naval powers were in the full swing of that but dissource com-petition which the aggressive activity of crimany had imposed. I very leading navy had an important program of nivial construction on hand and in 1914 the construction on hand and in 1914 the construction on hand and m 1916 the United States also forescenng the possi-bility of its eventual entrance into the war, only or its vectorial thrance the war, sanctioned its a single program an addition to our fiet greater than land over been voiced by any naval power in all the history of naval shipbuilding. Fo Great Britain was assigned the task of holding within its histories or defeating in the open within its harbors or deterring in the open the powerful German fleet and with a view to providing for future losses and making sure of having at all times a sufficient proponderance of power in the North Sea the British shipbuilding yards, both governmental and private were in structed to rush the uncompleted ships

of the 1913 and 1914 pr grams to completion

The other members of the I night France Italy, and Japan, realising that they were sufficiently strong in battleships and buttle crossers to take care of the fleets of Austria and Turkey practically ceased all work on their capital ships and concentrated upon unarmored ships of the scout destroyer and aubmarine type. All of the Allied navies particularly that of Great Britain, suffered heavy losses during the war Great Britain has

lost two dreadnought battleships, eleven predreadnought battleships three battle cruisers eleven armored cruisers, crusers, two second-class crusers, eight light crusers, and over forty destroyers
France has lost a semi-dreadnought battleship, three predreadnought battleships three armored cruisers, a protected cruiser, and cight or ten destroyers Italy has lost one of her finest drendnought battleships three predreadnought battleships, and half a dozen destroyers. Japan is short an armored cruiser, two light cruis-ers and a destroyer, and the United States has lost an armored cruser and several des-

The lifting of the censorship makes it possible to give in detail a statement of the detail a statement of the present strength of the navies of the world and to include a this the new ships which have been built during the It should be noted that because of the limitations of space, our tables ou the accompanying page include only capital ships, that is dreadnought battleships, pre-dreadnought battleships, and battle-crussers

The British Navy

At the date of the signing of the armistice, the battle-ship strength of the Beitish navy consisted of 33 dread-nought battleships, 21 predreadnought battleships, 7

STRENGTH OF NAVIES IN COMPLETED BATTLESHIPS AND BATTLE-CRUISERS AT SIGNING OF ARMISTICS

	Great Britain		United States		Japan		Prence		Italy	
Mr Duvele Agurea as heroseth green ire lake from a statement presented to the House Nesal Affirs (o multter in Documber 3th 111 and published in the heu York Times of the following lay	Mr Dansle' Figures	Chinack Pigures	Mr Danets' Figures	Correct Figures	•	Cerrect Pigures	Mr Dundels Pgures	Correct Pigures	Mr Daniels Figures	Correct Pigures
Battleshij + (lreadnoughts)	61	13	16	16		5	20	7	14	3
Battieshij = (j redresdnoughte)		21	83	19		12		11		•
Hartle-lin (obsolete)	_	7		٠	-	,	_			

"i ig ires for Japan were not given in Mr Daniels table Table showing the correct figures of the comparative battleship strength of the leading naval powers

obsolete battleships, and 9 battle-russers. For reasons best known to himself, Mr. Dennes, Secretary of the best known to himself, Mr. Dennes, Secretary of the Committee, credits the British nay with no predread-noughts or obsolete battleships, but lumps all three types together as dreadnought battleships. The capital ships completed during the war and included in the Circum Frest convex of three dreadnought

battleships, the "Benbow, 'Emperor of India, and

"Mariborough," of the "Iron Duke" class, ships of 25,000 tone, mounting tos 18 5-noh guas. Also, the "Aginocuri," a ship which was laid down in 1911 at Ellswick for the Brasilan government. In January 1914, she was sold to Turkey and on the outbreak of var, being still in the builders' hands, she was taken over by the British newy and named "Aginocuri". She is guist in seven 3-guist in seven 3-

wick, for Chile and thown as the "Alminate" or armamant consists of ten

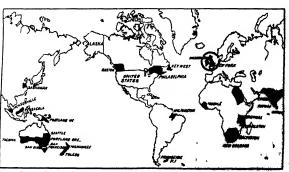
14-inch gua.

Of the five shape of the "Quoen Elizabeth" class of 27,500 tons, mounting eight

15-inch guns and steaming at 28 knots

Narpite were about completed at the
opening of the war and three others, the
"Vallant," "Barkam," and "Malays,"
were put in commission in 1915

They mount the same battery of sight 18-inch guns
Contrary to the general belief, Great Brata did not
build many new battle-crussers during hostistes. As a
matter of fact, only two, the "Repulse" and "Renown,"
were completed and joured the the Greand Fleet. They
are the longest and largeth warnings aboat, with an
orderal length of between 500 and 500 teek, a displacement of the complete of th



Geographical conditions under which the United States would require the most sewerful floot in order

of anti-unbmarine craft, we made a great increase in the strongth of our dreadmought first between 1914 and 1918 by the addition of sevien of the largest and man powerful ships in existence in 1918, we completed the Oklahoma' and the Newada, 27,400 tons, nounting as their man battery ten 14-inch guns The following year we completed the "Fennivytania and "Arsona of \$3,500 tons, cach mounting twelve 14-inch guns

Great Britain

These were followed in 1918 by th. New Mexico and 'Massianppi,' of 29 000 tons not twelve 14-inch guns ready by the summer. So that by the time the peace of the year and was ready to us draps he trais. In addition to these vessels we are building two more of the New Mexico class a mely the (altierum and Tennessees which will be of abrut the same displacement but will mean city the same target and the peace which will be of abrut the same target and the restaining rates as larger the

France

Battleship and Battle-Cruiser Strength of the Five Leading Navies United States

COMPLETED NA	treat E		ermound)		COMPLETED 2	United	States	DNOU N W		France
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Revenge	1916	25 800 25 800	8-18-inch	21 5	Pennsylvania Acisqua	19 17	3 (X	12 14 n b	21	
Queen Elizabeth Wasspite Valunt	1914 1914 1918 1918 1918	#7 500 27 500 97 500 97 500 97 500	6-15-inch 8-15-inch 8-15-inch 8-15-incl	25 25 25 25 25 25	Oklat i n Novada	191	00	1 14 inet 10-14 in 1	21 5 20 5	Curbe 1 9 -45 x 12 1 n 1 21 4 an 1 22 4 an 1 2 5 x 12 12 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2
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Eria Aginopuri	1914	27 500	14-12-inch	31 0	Arka maa Wyon mg L tal Florida	1011	2 30	1 F12 in 1	21	
Beabow Emperor of India	1914	25 000 25 000 26 000 25 000	10-13 5-u ch 10-13 5-inch 10-18 5-n h	91 5 91 5	Delaware N rth Dak a	1917	1 10	1 1-12 1 1 1-12 p h 10 1 nch	21 21 21	bland are tlated up 25.2 12-11 4 n 1 21
Iron Duke Marinecough	1914		10-18 5-inch	21 5 21 5	North Car line	- 191 1810	0 NX HK 17 NO	8 12 n h 8-12 n h	19.5	Indian wa
King George Centurion Ajax	1913 1913 1913	23 000 23 000 28,000	10-13 5-inch 10-13 5-inch 10-18 5-inch	21 5 21 5 21 5	Michigan PARTIT COMPLETE		Bent PA D	MMADNOU SIN	<u> </u>	LDEN BATT MARIPM PURDREADNO NI TIPE) (m D a C Ds Npeed
Orion Thunderer Monarch Conqueror	1919 1919 1912 1913	22 500 22 500 33,500 22 500	10-13 5 inch 10-14 5-inch 10-13 inch 10-18 5 neb	21 5 21 5 21 5 21 5	California	1911	32 000 3 100	(uns	Apced 21	Mrsi oau 1911 185 ()
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Implacable	1800	15 000	4-12-inch	18	Caso Dullio Andrea Dona	19	Ä	15 12 cl 13 2 l	21	Com Disco- pleted place Guns Speed
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	Com-	Dia- place- ment	Guns	Speed	PARTLY COMPLETED	BATT se k Begu	1	Gum	 Speed	Kash ms 1996 16 000 4 12 inch 19
Magnificants Sensible Prince George	1805 1807 1808 2807 1807 1807	14,900 14,900 14,900 14,900 14,900	4-12-10-0 4-12-10-0 4-13-10-0 4-13-10-0 4-13-10-0 6-13-10-0 4-13-10-0	17 5 17 5 17 5 17 5 17 5 17 5	Colombo Ke	els la i ut all ste presi	en I K	8 15 mel 8 15 mel 8 15 meh 8-15-meh 8-15-mel	25 25 25 25	1004 13 500 4 12 neb 18 18 18 18 18 18 18 1
Mars Charles Districts	1997 1997	14,000	6 18-jrich 4-19-jrich	17 A	Carnoticlo dur	ing war	×	8-15-incl	25	MP ETE HATT B- (ISERS
T-LAST-CO-LASTER						Com pl ted	Da pare o t	Cupa	Speed	Con Dis pleted t ace Guns Speed
	,213k	# 10 mm	Guas	Speed	Vit. Emanuele	19 x	1 800 12 800	1.19.194	21	
Parties	1986	\$1,000 \$1,000 \$1,000 \$1,000	6-18-inch 6-18-inch 8-18 8-inch	83 33 30	Vit Emanuele Regine Elane Napoli Roma	1907	12 800 12 800	2-12 inch 12-6-inch	21 21 21 21	Kirish ma 1910 27 500 8-14-inch 27 ?
		\$25000000000000000000000000000000000000	Gistoch Gistoc	83 38 30 30 5 38 5 36 5 36 5 36 5	Sun Giorgio Sun Marco	1910 1910	10 500 10 250	(4-10-inch (8-7 5-inch	22 5	that of any contemporary ships of which we know. In the predreadnought class we have 19 ships, 11 of which carry in addition to the usual predreadnought
, , , , , , , , , , , , , , , , , , ,	100	光觀	Liblan	# i	Pien	1909	10 600	(8-10-inch	29 5	battery of four 12 inch guns a powerful intermediate battery of eight 8-inch guns these are the six ships of
		1		L	Palicerto	1901 1901	10,000	4-10-inch 4-10-inch	18	(Continued on page 64)

(Continued on page 64)

Guns for the Fighting Front

American Heavy Artillery Designed and Built for Our Armies in France

Our experience in fl late war providit for a nation as unit; r i as we were but i sees i as we were but of a large measur future and adaptal in easier to 1 the personnel that it in trit was signed at it is yet all the signed at it is yet at the signed at it is yet at the signed at it is war we shall the little at the signed at t TI wrk f ın ınıfəri in infirit II well men constring the binitel traing that twee [sethle t give the ross surprangity and internal relations of the binitel traingular traingu

re late in of the military leaders among

In the troad field f engineering also in the troad field (inguneering also we showed climater set entroy and it sourcefulices particularly in the provision of ducks yards at rago in issees and in the reconstructual of the music railway system, which was allotted to us for the servial of our army at the first.

Even in the matter of million service although earlier were all will compare.

athough results were of sirjus service although results were six in coming we were beginning to sujjly our lighting forces at a very rapidly interesting rat and with promise of a huge air free if the war had carried on tuto 1919.

But in the matter of artillery and particularly and particularly

and particularly the licavy artillery w were up against a high problem wil ch in the very nature of things required time for its solution. Rifles can be probled d in great numbers at comparatively si rt notice machine guns also although requiring of requiring of the can be prilied at a comparatively rapil rate when once the plant is installed. When we come to field artillery however the task be one a more serious and the time element is the con trolling factor. It is known that our army had to dopend in the first months of

arm) had to depend in the first menths of our active service upon the French gun factories which fortunately were in a position to give us the artillery we so im-peratively needed. But when it came to the question of im-mediately supplying heavy artillery we were up against a situation—depite even our wast resources in taw materials. steel works foundries machine ships and skilled mechanics to say uothing of a plentiful supply of capital—which required time for its full solution



14 inch raliway mount Gun is wire wound Shell 1 200 pounds Velocity, 2,900 feet seconds



16-inch howitzer under camouflage screen at the front

war sollege general staff, and such of our leading generals as were withing, in their patriotic desire to avoise the country to the serious-ness of our lack of artillery, to risk the wrath of the icians sounded the warning for many a year previous to the war We have only to instance the case of General Leonard Wood who General Leonard wood who several years ago as Chief of Staff and persistently after the great conflagration broke out in Europe warned

us that we could not ibly extemporase artillery, either fiel

sitily octemped as the second of the control of the

nong-range gume of 12 and 14-inch caliber on massive railroad mounts designed for the shelling of the back areas of the enemy country far behind his front, attract most attention

m-inch Railway Mo

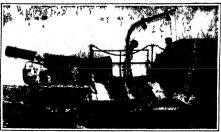
First among these is the army 14-inch high velocity gun on a railway mount



Permits all-around fire. Maximum elevation, 65 degrees. Total weight, 177,900 pounds. Shell weight 780 pounds. Velocity, 1,500 feet seconds. For strange fire against dupouts, cament shelters, stc. 12-inch merter railway mount







Eight inch howitzer on caterpillar self propelled carriage Speed 1 to 4½ miles per hour

This mount was designed prior to the beginning of the war It was intended primarily for the mobile seasonat defense of this country and of course, was admirably adapted for service with our armses in Prance. Cun and cradle are mounted on a heavy sell-plate garder the entire mount weighing about 200 tons. The gun is wire-wound the eabher is 14 inches and it is 47 feet in length 1 if frees a 1 200-pound projectic with 400 pounds of powder, with the high mussile velocity of 2,000 larger way of the country of the c This mount was designed prior to the beginning of the

the gun is returned to bat-tery by counter recoil springs The gun is placed in the firing position on a cast-steel bed plate, which is adapted to give the mount a traverse of 360 degrees Abou five hours are required to place this mount in position using a well-trained crew The rate of fire is one round every two minutes and the mount has the ad vantage of being adapted for ransage of Deing adapted for use against moving targets such as battleships as well as for use against stationary targets on land

Twelve-inch Sliding Railway Mount

Another type among big guns is the 12-inch sliding railway mount. This has no recoil mechanism the recoil being absorbed by friction produced by sliding the mount on the special treak which supports it. It is operated on a curved track and is trained on the objective by moving the mount backward or forward. The entre mount is 105 feet long weighs approximately 600 000 pounds and is carried on four trucks of eight wheels each pounds and is carried on four trucks of eight wheels each it has been moved on railway tracks at the rate of 40 miles an hour. This 12-inch gun is 50 feet long at fires

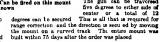
a 700 pound projectile with a m zrie velocity of 3 200 feet per second (the highest v i ty for a big shell of which we know) and with a r gc of appr ximately 28 miles. The mount was bill it cordinance Depart-

which we know, and will a r gc of appr sumately 28 miles Tho mount was bill it of Ordnance Department with the exception of the gui itself it 85 days After the track is laid and be n siringers placed only about five maintes are rejured to n sw the n cunt into position and get it ready for firing and it may be

made of howitsers which fire their shills at a high angle of civati n & that they may drop with a steep angle of descent upon dugouts concret shelters ammunition dumps um ortant cross roads and other vital ci ments in the enemy terrain. Const. 1 us among these is our 16-inch howitzer developed by the Ordnance Department which is one of the ment powerful howitzers known it can be fired or its mount up to 45 digrees

cl vation directly from the trucks when resting on any standard gage track The of partly in the recoil mech at ism and partly by per-mitting the car to move backmitting the cer to move backwards along the track on its own wheels After firing the mount is returned to its original joustion by means of a gasoline driven winch, and truck which hauls in a cable anchord to the track sheed. The xtreme range is about turied with the track and the track of the mount is 325 000 pounds and its length overall is 88 feet 4 inches to be a second of the control of the mount is 525 000 pounds and its length overall is 88 feet 4 inches the pun of over forty five tons it is 8 well balanced on its frunnons that it can on its trunnions that it can be clevated to 65 degrees by one man in 40 seconds. The gun can be traversed







Sixteen-inch railway-mount howitzer Total weight of mount 325 000 pounds Can but to 45° elevation. One of the most powerful howitzers known

removed from the firing position in an equally short time Sixteen-inch Howitser Railway Mount

The long-range high velocity guns above described are designed to attack the encily a communitations rail way depots ammunitation dupps sipply enters etc from 15 to 25 miles back of the fighting line. For the attack of the belt of country is; pa fex miles behind the front and extending up t the fr nt it elf use is

Twelve-inch Mortar Railway Mount

The 12 inch mortar railway mount is designed to permit all around fire and may be elevated from minus (Continued on page 62)



Pirestan aptilizing elector, Statt in four stone; 236, 5, 10 and 20 tone. One hand



American "Bahy" 3-ton tank. Speed twice that of a horne. Can haul guns Used against machine-gun nests

Fitting the Shoe to the Soldier

The Evolution of a Satisfactory System of Measuring the Soldier's Foot

THE pe per fitting previously cov r I with normal thor ighters by givers to a matter of al n wl dto the adoption is the War Depart in mt of new regal special system of int purpose I this article

In her nermal conditions a company on n and record l with httle lifteulty see that every number of his ommand was fitted with as nearly correct size of shoe as neces-sary. Fix few evils could be rectified within the company and might be considered negligible. When the fact is considered that



Some phases in the evolution of a system for fitting shoes to our fighting men

At the left. An iron device based on sliding iron blocks but discarded because it required use of a paper chart.

At the left. An iron device based on sliding iron blocks but discarded because it required use of a paper chart.

At the width indicator with foot function developed by the Army. Navy and Martine Corpa in 1918.

At the left and the left of the left of

he must now depend at times upon men unused to making such his to wheat from the 138 standard combination sizes the proper size for each man and do this without loss of time the need of a simple machine is evident. I urthermore upon a compila tion of the tariff of sizes used in the many organi tions the Quartermaster Corps must depend also for tions the quartermactic Corps insula depend asso for its final tantiff for ordering from manufacturers. The much needed machine in addition to saving time matter acturacy of fit to each solder and a correct tariff for subsequent ordering. In a desire to make haste in supplying the recruits with their service shoes upon their arrival at the

training camps commissary officers and their as sistants found it necessary under former conditions to allow the recruits in many cases to specify the sizes they should wear and in some instances the new soldiers were permitted actually to pick out of sto k the sho s in which they received their initial training. This cardless matter is no longer allowed because recruits from civil life do not know the sizes of army last shoes which they should we ar in pre-paring for and participating in actual warfare. In

vestigations made at a number of the concentration camps disclosed the following characteristics I Ignorance of their correct foot sizes even in civilian

2 Instrance of the difference be tween their see in civilian footwear and the corresponding use in army shoes 3 Ign rance of the matter of making proper allowan e for foot-xpansion in the arms she produced by hard marching and the carrying of the solliers fighting equipment. 4 Personal vanity as shown in a desire to wear as small a size as possible

district to Warf as sing as possible.

And it is well known by now that solders must wear properly fitting shoes. The human feet is a fragil stricture exitaining 26 small bones of irrigular shape. These small bones must be kept in their proper form and place to ensure effected. locomotion Again feet troubles gener ally lead to leg troubles and a soi her who is impaired in his lo in tion is no longer a good suldier. Hence the importance of properly fitting shoes is a paramount con sideration in any efficient aimy

It has remained for Mr I limer Jared Blass the president of a leading shoc orm pany of Boston Mass to color satisfactory army shoe fitting system. His principal aim in devising his system was to chiminate, so far as possible the likelihood eliminate, so far as possil it the likelihood of matakes being made in set imp shor sizes for the soldiers. It was believed that having got each new soldier right on the spot at the time of his entrance into the Army, and having disablesed him of the idea that he limited was to exercise any jurisdiction over the selection of his service shows, the new system of his service shows, the new system of



Length detector used to cotain size of shoes when markings are defacted, developed by Reclamation Department overseas

that would correctly provide for the 138 different com-binations of sizes and widths required by the complete size-range of enlisted mesi-and yet be simple enough in



Kit or carrying case containing the fost-measuring and shee-fitting devices.

rger than the bottom of an adult human foot, which is the foot-measwhich is the foot-measuring device, and a set of thin metal blades, each fitted with a metal knob on one end, which is the shoe-fitting device. The larger or measuring machine translates the foot length and width into the shoe length and width The set of blades compoung the shoe-fit-ting device is employed to prove the accuracy of the size as disclosed by

easuring the soldier s feet in the larger machine. The measuring machine is constructed for the great a ne measuring machine is constructed for the great army of average feet—that is, feet that present no marked abnormalities. The elevation of the heal por-tion is of scientifically correct height for positioning the human heal when the foot is measured for the the human heat when the foot is measured for the army shoe. Fin angle at which the side wages are set was determined from a composite of the angles of the army time in the army discrease. The adjustment of the mechanism governing the opera-cian of the postate on the width-scale by the spread-ing action of the side wangs, was also worked out upon a sometitle base.

The precedure of measuring is as follows:

The measurer requires the solder to remove his old above, put on his army pack, hold his rifle, then measuring machine, with the heel back mugy against the ourred blook at the back It is essential that the foot be in the center line of the machine, that is, the singuiary health through the center of the foot from heel to toe should be over a similar line on the bottom of the machine.

the notion of the machine.

The measurer then releases the wings at the sides and allows them to press in against the sides of the solidier to foot. He also slides the plunger, at the front of the machine, along until its flat end

rests lightly against the end of the soldi

foot
Then the soldier, keeping his balance by holding onto some sort of brace above, rises times on the ball of his foot. Pits act of rising closely duplicates the act of rising closely duplicates the act of walking, and, since the soldier is carrying his expulsion service food, the weight thus put into the spread of the foot when the part of the present of the foot when the present of the present of the foot when the present of the present of the foot when the service of the present of the foot when the service of the present of the foot when the service of the foot was the service of the foot when the service of the foot was the service of the foot when the service of the foot was the service of the ser

asour sail as such off the device. The resulting spread of his foot, for as well as sidewise, thrusts the st plunger forward so that its little mapoint automatically againster the so shoe length; and this two side edem

point automasseasy super-side length; and the few used very show longth; and the few used in threat apart so as to assue the erro-pul-on the interest cash to record autometic the correct show which as A, B, C, sho h, his so to of risking several times (the ball of his foot, the neighbor from the forth. The meature abserves this obe-and takes the meldies mark, between certessis points to such by the justicity the correct wields. Now having determined the stee of a for the nolder to try on, the meanings cents on the second pass of the thinger solution, which is to prive the acrossibility

A Stretching Wheel for Red Cross Workers

TYERY Red Cross worker knows how much time and labor are required to fold gause before cuttling it sate these required sizes. Unwinding the bolts and spreading layer upon layer on the long tables and getting all the layers smooth and even, is a task dreaded among the headquarters workers.

seadquarters workers. To dighter these work and make it comparatively easy, a Cincinnati man kit upon the Red Cross stretching of the strength of the strength

Other Red Cross workers are hereby requested to 'steal" the idea and make wheels like it

The Current Supplement

THE study of the wonders and the mysteries of our sarth offers endless attractions to the student and the scenarist, and many of its problems are of the utmost sconomic value One of these problems that has not seen definitely solved relates to The Aps of the Barth, and he paper having this title which appears in the current seus of the Schemyric American Supremark, No 19246, for January 18th, will be found of more than reducery interest to the general reader. The task of manfanning an army in the field is infinite in its unifications, and on its seccess depends the results of the content, fully as much as on the actual righting and even more so, as without adequate supplies no anaying photographs, tells not one of the ver present problems confronting those schild the fighting lines, which is far eaching in its effects. The final intalment of the papers on The Mozoo advance of Versanels, with a large number of unusually interesting photographs as

urmy could exast "water for an Army, maying photographs, tells of one of the over present problems confronting those rehind the fighting lines, which is far eaching in the effects. The final instanct of the papers on Ta Macco additional tells of the papers of the of th

A Model Hospital on Wheels

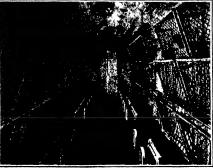
FOR the rapid and proper transportation of our wounded in France, there have seen built in England a number of hospital raises. To be more specific, the hospital raises To be more specific, the hospital raises have been built at the works of the least Central Railroad of England at Duknafield, and it is perhaps safe to say hat these trains are the last word in the ransportation of wounded.

The accompanying illustrations give



A Cincinnati man invented this stretching wheel for simplifying Red Cross work

some idea of the ward ear of the American hospital train, which is fitted with every modern appliance for the confiort of the wounded near during long pourneys Each train carriers a large Red Cross and the letters U S as well as the train number. There are accommodations



With its beds raised, the ward car can be quickly and thoroughly cleaned

for both lying down and sitting up cases as illustrated. The train also includes a kitchen car and a coach for at tendants.

New Way to Make Castings of Non-Ferrous Alloys

A PROCLSS for forming easings of extrain nonproporties on the notal is an smoothly a New York regime ring company here's companions are not trees in a notal by the second of the companion of the trees in and Parts made by the process are said to possess greater tends strongth increased density and to be free from blow holes their crewtalline structure, and to be finer and the machining qualities superior.

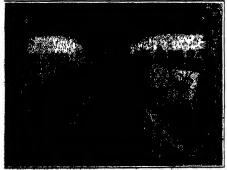
The new process consists in jointing the molt in allows into motal molds and forming or congoling them ander pressure. They are really discussings formed under high pressure. The inventor claims that the process gives absolute control of the desired physical properties and the machining qualities. A very large number of fuse bodies for shrapisch have, already been made by this process. The composition of these is 80 per cent aluminum and 20 per ent zine. It is claimed that almost any grade of non-firming salley.

It is claimed that almost any grade of non-firms alloy can be handled by this process the easting buring made in a specially constructed variomatic machine by which a large number can be postured in a day. Besides a 90-10 aluminum cupper alloy there has been inaide one of 80 per cent cupper and 40 per cent zinc with a trace of kad baving a femile strength of 49-900 pounds per square inch and an elastic limit of 20.750 per cent in two males. Another almost almost almost almost almost almost almost almost an order and 15 copper is reported to has a tensel settrength of 42.700 pounds of the strength of 42.700 pounds per contract and the strength of 42.7000 pounds per c

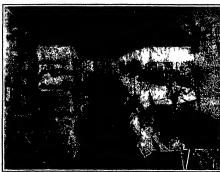
p i cent rine and 15 copper is reported to have a tensile strength of 42 700 pounds per square inch and an clastic limit of 29 400 pounds per square inch with a definite clongation of seven per cent in two inches

man interesting feature of the process is the possibility of making as alloy of ulunum copper and trou which has a low coefficient of expansion. Success is said to consent in a special secret method of in troducing the from into the mixture. The ordinary piston made of aluminum and copper is said to have tree great a coefficiant of expansion but the introduction of the trous is regarded, we making it possible to the control of the control of the consention of the control of the consention of the control of the c

One of the many advantages claumed for this process is that important parts of artiral motions can be made of great strength and lightness. In the case of pistons the stringth can be put into the head and the can be machined down to lighter weight and still possess unusual strength. In process has been patented in the United States and in Great Britain, Japan and other foreign countries.



A want our property for both lying-down and sitting up cause



For the handling of lying-down cases, all the bods of the ward car are prepared

The Service of the Chemist

A Department Devoted to Progress in the Field of Applied Chemistry

Conducted by H. E. HOWR, Chemical Eq.

Federal Aid for Research

FROM a priliminary consideration it would seem possible to defend the general proposition that our terms consideration it would seem possible to defend the general proposition that our content consideration is desirable to the consideration of the consideration along lines which would doubtless have remained un-touched for many years had the investigations been left for those most interested in the results. Our farmers are not alone in this cititude for it might be shown in litigation or threatened law suits much of our brilliant industrial research has had its inception. I rue agriculture, in common with other enterprises, profits from most of what is done to the manufacturer slabor atory but, likewise the factory gains when agriculture advances and this is simply further proof if it were needed of our interdependence in our complex civiliza-

While the agricultural experiment stations have not always been managed to suit every one and some may even consider many of them failures some of the results have been of the greatest value Consider what has en accomplished in improving strains of corn oats and wheat and what has been proven with reference to seed selections, gcruination tests and the breeding of corn for example, to increase its feeding value. At another point work has been concentrated on questions of animal hasbandry, the development of better stock and the study of feeding problems so that we may produce the maximum food with the minimum raw materials maximum food with the minimum raw materials kurther the problem of what an animal does with its food has been studied with the result that more is known concerning its economical feeding and the point at which further food means a substitution of water for the fat previously stored and then the critter eats his head off. Much of the stability of our dury industry is off Much of the stability of our drain indexer, a directly due to agricultural (ollies and experimental station work no small part of which has been the in vention of simple dependable testing devices. Then there is that research which led to an increase in the average number of marketable tobacco haves per plant equivalent to about 200 per cent increase in yield with the same amount of land and labor. Walnut trees that the same amount of land and labor. Walnut free that grow as rapidly as poplars and poplars which attain a height of 10 feet in 11 months are other examples of what can be done in agricultural research.

what can be done in agricultural research.

The dumping of cutton seed into the rivers of the South created such a nuisance that laws were exacted to stop the practice. On the basis of 1917 and 1918 prices the application of research to this waste problem added nearly 340 to the value of each of the 11,500,000. bales of cotton grown

Crickets ate the binder twine used in tieing the sheaves causing considerable loss in the wheat fields after the grain had been put in shock until chemistry showed how to make binder twine unattractive. It was not enough to make it poisonous for there were crickets left over to cut other twine It had to be made repellent

These will serve as examples of the influence of law and necessity in instigating research. To interest the average man in research that strikes out to find something is a much more difficult task. The war has been a great iducator in this direction and well qualified research en are in greater demand now than at any other time Ihree hundred and fifty-five American manufacturing rencerns maintain their own research laboratories and many more employ the facilities of commercial laboratories consultants and educational institutions. The total is but a fraction of the number which should take full advantage of what modern science offers and the aymau has yot really to appropriate research. Honce the proposal now to establish engineering research stations throughout the country one in each state or to appropriate money for each state to be expended in the support of research of importance to science and industry carned on in whichever educational institution might show steelf best suited to undertake the specific problem

show itself best suited to uncurrant the specific problem it is now proposed to grant \$15 000 to each state the irst year, \$20,000 the next, \$25 000 the third and \$30,000 the fourth and subsequent years. The details of dimanstration are not decaded, but the indications are hat an impartial committee in each state will be made osponsible, seeing to it that no money is spent without in adequate return in productive work and that no

favoritism is shown in the sesignment of problems. A central organisation in Washington will correlate the work advise and suggest problems of national importance but shall not be directive or administrative in its function. It may be found advisable to change the secretary of this central bedy annually appointing the secretary of the security of the security of the control bedy annually appointing the out the danger of stagnation. Such a post, properly paid would be attractive & many secentists qualified to perform the work since at world offer many advantages. The policy theory official stage that the control of the security standards.

This plau, known officially as the Smith-Howard Bill (S 3805 and H R 9080), is undergoing modification and improvement, many of our country s best minds being active on the questions involved The National Research Council, the American Chemical Society, the foremost educators and engineers sanction the principle and incan to see a workable plan prepared for the approval of Congress The competition between the educational matitutions in each state for this federal aid, extonal institutions in each state for this federal and, the granting of which, will in itself be recognized on the high quality of work being done there, constitutes one of the sure benefits Facilities will be provided with which those qualified may work under the but conditions as regarded equipment and assistance. A larger number of our young people will acquire the scenario method of attacks and become a equantic with materia-method with the benefited when they go out to it, the state of the provided with the provided with the state of the s the laboratory work In some instances research can be ected from present interesting but less practical lines to those substances of more urgent importance and equal

That federal aid to research can he given in a practical, efficient manner and be made profitable has been demonstrated to the second s strated by the agricultural experimental stations. We should do better, in view of our experience, with the new plan. The war has conclusively demonstrated the value of scientific research and all countries are organising to of scientific research and all countries are organising to pursue at diligently I he opportunity is offered for the people at large, our educational institutions and our industries to become really interested in research and to profit by its achievements in the various specific holds

Some Phases of Reconstruction

CHEMISTS generally realise that the post-war problems are more complex than those imposed by war
when questions of low costs and competition are not so
important. There has been much looking shead and
one of the first instances of concerted action was a
recent meeting of the Council of the American Chemical
Society. The question of what to do with our access acid production, our gas manufacturing plants and the muniton factores could not be considered a part of the program, the discussion being on subjects of general policy

The Germans have been called the brick layers, not the architects of scenees and among the tedious pieces of work performed has been the compilation of chemical data and statutates "Balletten had become an almost holy word in organic chemistry because in no other place could so much fundamental information concerning organic chemicals be found as in this excellent example of organic chemicals be found as in this excellent example of brick laying And yet Bellistein is not wholly satisfactory. The work of non-Germans is slighted in the statuties. It is 20 years old and incomplete Arrangements are now under way for English speaking chemists to combine on the truly genite task of pre-paring a compendrum of chemical literature in English to be compiled in each of the many sub-divisions of modern chemistry. Stags are also to be taken to make Souchy and notably "Abstracts" the vary best of their kind offering advantages which will insure the publication of our American work in them rather than in foreign journals as herstefores. The matter of tariff on importations of hemicals and

journals as heretofores.

The matter of tariff on importations of chemicals and seasothic apparatus has been of interest to many chemical neutrinos and a seasothic apparatus has been of interest to many chemical neutrinos and a seasothic properties of the seasothic properties of th in one university The

The need for a closer cooperation between universities and industries is apparent. If the industries are to continue to benefit by the work done in the schools and are to have men properly prepared for their service something must be done to make the teaching profession something must be done to make the teaching profession more attractive financially One of our greatest teob-nical schools, at the present moment, finds it almost the lack of money, and a professor can not pay his bils with sendment Industry must become more directly interested in education if we are to maintain our world-wide advantages. The somety appreciates the situation and a number of sub-committee are to be appointed to work with the main committee on this perplexing problem

problem. Chemists enjoy the unique position of being really interested in all industry either because they contribute some manufactured article or have some part in the development and maintenence work. They realise the mocessity of an active, sustained export trade and urgs any measure calculated to improve it. This is ample reason for urging the adoption of the metric system of weights and measures in the United States as rapidly as possible Many successful American exporters are using the metric system now, having found it a handicap to adhere to the English system in foreign commerce It is doubtful whether the metric system will come into It is consider a considerable property within a considerable property of years, due to alleged complications in land measurements although the civil engineer already uses tenths of the complex of the c familiar with it.

Closely allied with reconstruction is the work looking to guaranteed peace for the future. It seems important to guaranteed peace for the future. It seems important, therefore, to continue some of the research carried on so successfully by the Chemneal Warfare Service and to coordinate research in the War and Navy departments. This is also the time to record in full the details of what has been done on war problems and publish anything not of mintary importance for much of this research has both as essentifies and midurant indirects. The best talent cotta a scientific and industrial interest. In a bost taken in our country has been in cooperation during the emergency and it would be a distinct loss not to have all records clear before the first chemical military unit in hastory, and recognised as such, is allowed to disband

hatory, and recognized as such, is allowed to disband. The war served to emphasuse the desirability of more extensive American research in the field of drugs and medicines and to that end careful consideration is being given the suggestion that an Institute for Co-perature Research be formed in such an institute chemists, biologists and manufacturem would work together on the nearly innumerable problems which are

of practical as well as accentific importance. The American Chemical Society has only begin its study of reconstruction on the committee plan and its next meeting is expected to yield valuable results.

Scientific Patents

WHEREVER research is proceeding in sustained and in a sustained service of the communication may be expected. Because of the cortumntaneous under which estentiate serve in the Government's employ the practice of assuring patents to the people has been followed since early in the eighties. This plan has the fundamental waknows that unless zone protection can be secured no weakness that unsemments processor can be secured and one is going to see any process through its develop-ment stage and consequently very little has ever come of those inventions donated to the public is their infancy

Two siternative plans are now under consideration.
One of these provides for a non-exclusive free license One of these provided or the control of the pulsarion of the control of the contr

An Ruormons Log Raft for Overseas Transportation

WHILE log rafts are by no means new, insumuch as they are quite common in this and other countries, the huge raft recently constructed at Haparanda Swedon, and used to ship a large number of legs to Copenhagen, Denmark, as worthy of measine mention.

of passing mention

The great raft, which is shown in the
accompanying illustration as it appeared
anchored at a wharf in the harbor of
Copenhagen, measures 387 feet long, 55½
feet wids, 10 feet above the water line and 1614 feet below

The raft took six months to build and

se as much wood as four big steam contains as much wood as four big steamers. It is held together by an ingenious system of steel cables and wires, and is capable of carrying a large amount of material. The crew consists of seven men.

Magnetic Pulleys

MAGNETISM in some of its many IVI applications is so commonplace that t no longer creates particular interest Upon it the electric dynamo, the motor,

Upon it the escentic dynamo, the motor, the lifting magnet and many other familiar slectric appliances depend for their operation An out-of-the-ordinary application, however, and one that will be new to many readers is that presented by the magnetic separator pulley, as used in preatly mcreasing list of industries

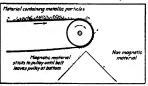
practly moreasing lat of industries. These devices are useful wherever it is desired to unove continuously the magnetic content from non-magnetic bulk material. For example, they are successfully employed in separating pick heads, coupling area and other metals from bulk good passing to a rusher which would be damaged by the entrance of under natural. They are used for a similar purpose at shoophate rock mines and quarries. In the production is sufficiently are available for removing ram iron and steel from the wood chips before these are leavesed to the suffite tanks. They are also found valuable in the manufacture of cement, the production of present and insection, the manufacture of cement, the production of present and insection, the manufacture of cement, the production of present and insection, the manufacture of cement, the production of typeum and hmestone, the making of terrs and doubly so in freeing grains, spices and pypean and amestone, the making of terra-cetta clays, and doubly so in freeing grains, spices and tobacco from att of iron and steel before granding. Even in such an impostic place as the city disposal plant they are put o work in picking out tin cans, horsehoes, nais, etc., rom the worthless material Likewise the high cost of netale has made the saving of metal turnings and the separation of iron and steel from brass well worth while

eparation of iron and steel from brass well worth white Another interesting application is found in the sugar ndustry, one m which it would seem that there would be to field for such equipment. The separator here is in-talled to remove from animal charcoal iron rust or iron ncide which is collected by it while passing through he ovens and being baked This baking process is



Huge raft made of logs held by steel cables, which made the trip from Haparanda, Sweden, to (openhagen, Denmark

necessary to eliminate from the charcoal the impurities necessary to eliminate from the charcoal the impurities which it has absorbed from the sugar. The magnetic material is especially prevalent after the retort has been repaired. Under ordinary conditions the magnetic pulley is energised only part of the time two weeks our of a most hor so, this being sufficient to keep the role.



How the magnetic pulley sorts out the sensitive from the non-sensitive

oxide out of the bone charcoal so that trouble with iron

oxide out of the bone charcoal so that trouble with iron coloning in the sugar is provided. A word or two as to the general scheme of operation of the magnetic pulley separator may not be out of place. It is magnetised by passing direct current windings in the interior of the pulley. He current sets up a magnetic flux which passes through the belt as it turns about

the pullcy thus attracting any iron or steel contained in the material which is carried on the belt. These pieces are then carried on the belt. These pieces are then held in outact by the pulley in til the belt leaves it on the under side. Here they are dropped, and collected in a lox which is kept well separated from the shower of the other material leaving the belt by means of a barrier is shown in our drawing means of a barrier vs-shown in our drawing. Direct curriet is required to incrigate the pullby although of course, the alternating variety will very likely be used to rotate the belt. Only a small amount of junce is necessary to keep the magnet working the average for the sizes in greatest use being but a few ampress standard pullevs can therefore be consected it any 110 or 220 wolf direct. current system although pulleys may be designed with coils suitable for operation on currents of 500 volts or even more

Data on Women's Work Wanted by Labor Department

THE Woman in Industry Service of the United States Department of Labor is collecting and distributing information on such topics as the extent of employment

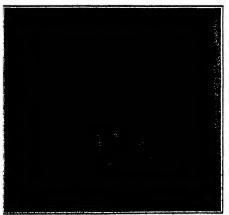
of women during the war, the wide variety of their employment the methods by which they have been successfully introduced into new occupations, and the safeguards with which it has been necessary to surround them in the interests of their health and efficiency

Plans are being made to establish a pictorial record of the work women are doing and the Woman in Inof the work women are doing and the Woman in Industry Service is asking for the endperation of the employers of the country in excepting these presents which women are working, particularly those in which women are substituting for men, mechanical adjustments installed to enable women to do work formerly impossible for them safety devices that have been found necessary to protect women workers and special

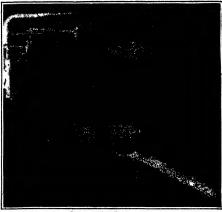
found necessary to protest women workers and special arrangements and caupment that have been installed for the comfort of the workers. Manufacturers would be rendering valuable assistance if they would forward to the Women in Industry bervice any pictures of this description that they have or are able to obtain. If any firm has recently improved the conditions under which its employees are working pictures taken before and after the improvements were turned to the contract of the conditions under the conditions and the conditions and the conditions are the conditions of the conditions are considered with the conditions are considered with the conditions are considered with the conditions are considered as a state of the conditions are considered as a state of the conditions are considered as a state of the conditions and the conditions are considered as a state of the conditions and the conditions are considered as a state of the conditions and the conditions are considered as a state of the conditions are considered

ticularly significant facts

If the pictures are published the names of the firms will not be used without permission



At clear singer magnetism is a powerful force



The magnetic pulley in operation

The Motor-Driven Commercial Vehicle

This department in he to to the intensite of present and prospective owners of motor trucks and delivery wagons. The editor will endeasor to ensure way uest a relating to mechanical features operation and management of commercial motor vehicles



Wounded Canadian soldiers learning to operate farm tractors

Farm tractor built by a prominent Italian motor car company

Teaching Wounded Soldiers to Operate Tractors

THF problem of providing suitable occupation for wounded soldiers has occupied no little of the attention of manufacturers of farm tractors as well as others Canada which has had the wounded soldier problem to deal with for some time has opened a number of schools where the men are instructed in the handling of tractors and it has been found that even artificial limbs are not necessarily a serious disadvantage in this line of work Of course some of the men take to tractor driving more readily than others, but on the whole the idea has worked out very satisfactorily The matter is all the more important because good work with a tructor calls for a good operator, a good tructor with a poor operator is capable of turning out highly unsatisfactory work

There is an instruction base in Toronto, Canada where a considerable number of solders have been made familiar with tractor driving. All the men there have received wounds that have made it impossible for them to resume their former or upations, and the tractor idea has therefore a strong appeal to them The an artificial leg not withstanding which, he did excellent work

Protection for the Truck Driver

A the commercial vehicle grows in importance as a means of transportation the man who operates it quite naturally comes in for increased considernation. In winter weather he is likely to suffer a good deal without proper pro-tection. Such protection is afforded by a cab that is supplied as part of the regular equipment of a truck that recently has been placed on the market by a firm whose attention has inthirty been com-hined to passenger cars. It is customary to sell trucks 'in the chasses all ready for the body, but with no body on the frame. In this instance the usual cus-tom is followed, but the cab is added. The cab is of very substantial con-struction and instead of providing only custom is considered. It completely houses

partial enclosure, it completely houses the drivers seat. In front there are large glass windows which can be opened when the weather is mild and at the sides, in place of doors and windows there are heavy curtains that fit closely and snugly neavy curtains that fit closely and snugly and are readily adjusted either to open up the cab or to let the driver get in and out, in the case of the door sections

Very large flexible panels give a good view in all directions. The seat is more than usually well upholstered and, altogether, the driver of one of these trucks will find himself a good deal more comfortably situated than most of his fellows. Side lamps are mer t flush with the front The front panel at the same time forms the dashboard of the truck and serves to support the rear end of the hood

Engine Heats Its Fuel Three Times

THE very large percentage of kerosene found in the gasoline that is commonly supplied today has made it necessary for all manufacturers of gasohne engines to take incurry to supply considerable heat in order propriv to vaporize the heavy constitu-One manufacturer of

hight motor trucks takes the precaution of heating the fuel three times in order to ensure its being thoroughly a portion and to distribute the

thoroughly 1 portion and to distribute see heating uniformly throughout the vapor. The first heating is by means of the ordinary stove on the exhaust pipe, through which the air drawn through the carbureter is made to pass. Leaving the carbureter the air, together with the atomized gasoline which it has taken

A cab to pretect the truck driver

he truck drives

soil preparation and harvesting

There is no frame, in the ordinary
acceptance of the term The sughes,
general and rear atle are stelled in
mounted in four wheels, so that no other
mounted in four wheels, so that no other
condourn, which extends out to the rear
wheels, makes a right angle with the
crankrose and gazerst housings, the whole

from the carbureter enters a passage cored between the cylinders this being kept hot, of course, as long as the engine runs I satly the gas impinges against a metal surface the other side of which is in direct contact with the hot exhaust gas -in fact the surface is one of the walls of the exhaust manifold. The result of this arrangement is a clean engine, maximum power and a low fuel consumption

Italian Manufacturer Prepared for After-War

Tractor Demand A LARGE Italian firm which manufacturers not only automobiles, but trucks, motor boats, surplanes and numerous other automotive products, has designed a three-plow tractor that is intended to supply the needs of the average farmer



Phantom view of a universal joint with large bearing helie

forming a big T. Bitch a construction gives absolute rigidity and all the strength that could possibly be required. The gearnet allows choice of three speeds and in fitted throughout with ball bearings and final drive to the rear axis is through a worm gearing. A peculiar-feature of the inactine is that the worm shall be such as the second of the speeds and shall be second through the bosing at the rear and carries the pulley for the belt used in diving stationary machinery. As the pulley thus comes between the rear wheels means are provided for very quickly and easily removing one wheel, on the side toward the machine to be jack is used for raising the tractor and holdingsit up when doing belt work. The source of power is a four-cylinder block-cart engine that is practically identical with the engine used by the same firm in one of it a 54-dow trucks and has a bone of 100 mm and a stopke of 180 mm. maximum speed of 2 7 miles an hour and a speed on low gear of 1.2 miles an hour and the rear and carries the pulley for

Big Steel Balis in Universal Joint

Big Steel Hellis in Universal Joint A UNIVERSAL Joint of teamsually inter-A cetting constructions used in a 15-5 con truck that is making, a good record for itself in service. It this joint there is a total absence of the brain fish theating surfaces and cytindrical Journals. In-stead there are singular hardward received hellis mounted on opposite such of a trumpion pin at the end of the propolar shelf. The steel housing of the joint is made with two oppositely disposed growers or races somurately formed for the tuffs to vort in; they are alongsized, theywere, as races accurately formed for the work in; they are elongated, by that the balls are allowed the lo that the balls are allowed in motion becessary to permit operate at an angle. The to turn on the truming plane are constantly skifting in



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What Machinery Is Doing for the Walnut Industry

(Continued from page 51)

they are distributed across one end of a save which operates like an endless balt.

This save conveys the nuts beneath a chute which extends down from the over-head motor driven blower that operates the vacuum device. This arrangement the nuts which are below a certain waight leaving the heavier nuts of grades one a (we to pass to the end of the seve and glide down a long chute to the packing shed The third machine invented by mombers

of the association to convert the oull into a profitable by product is the shell separator.
This is used to handle the tailings of the After the nuts are cracked and the girls have extracted from the shells all of the meats they can find there are usually small bits of meat left in some of the shells, and women who are either careless or new at the work frequently overlook choice pieces of meats and sometimes whole halves while working over a pile of cracked nuts

noted that there was con siderable waste from that source, so be had a machine built to handle the tailings, and a manufacture to under the salings, and it has resulted in a saving of \$50 worth of broken meats per day anne it was put into pieration. This devore is built on the pian of a small threshing outfit, and yelds a product material which before the final situng, runs about 80 per cent the final sifting, runs about 80 per cent halves and broken pieces of nut mests and 20 per cent of shell particles

The walnut grower used to average about 3 cents per pound for his culis, and about 3 cente per pound for his sulls, and was unable to separate the shriveled meets from the sound ones, so the value of his better med or the sound ones. The sum of the sulls, and the sound nuts sell proportionately higher because they are of standardised quality. In 1915 the association cracked and sorted nuts by hand and marketed 431,000 pounds. Last year it sold all the means it could obtain, and these sold all the means it could obtain, and the sum of year it is marketing 1,500,000 pounds of culls alone by the by-product system.

Guns for the Fighting Front

(Continued from page \$8) five to plus 65 degrees, having a range of nine miles at the latter elevation. The total weight of this mount is 177,000 total weight of this mount is 11,000 pounds, the gun weighing 29,000 pounds, carriage 57,000 and car 90,000 The projectile weighs 700 pounds and the provider charge 65 pounds, which gives a mussle velocity of 1,500 feet per second I his mortar is not designed for long-range but for plunging fire at shorter ranges, where great penetration is desired. The shells, filled with high explosives, are very effective in destroying ammunition dumpe dugouts, cement shelters, quarries, etc When it is necessary to bring this mortal nearer the enemy, provision has been made to replace the standard six-wheel trucks by narrow gage trucks making the carriage very mobile and effective

Upon firing, the mortar moves to the open iring, the morear moves to the rear about thirty inches, the energy of the recoil being partly absorbed by the resistance which the fluid in the recoil cylinders on the bottom of the crade, offers to being forced past the pistons nortion of this energy, sufficient to return the gun to its original position, is abs by compressing the air in the recuperator by compressing the air in the recuperator cylinder on top of the oradic. The return of the mortar is eased by buffers in the front of the recoil cylinders. Approxi-matly 300 rounds have been fired from one of these 12-men mortar railway mounts with no impairment of any of the working parts

The guns above described are all adapted to transportation on railway tracks and in to framportation on railway tracks and in many thousand soldiers. It advances addition to those illustrated, mention against machine gun fire, and can pull gain toch railroad mount, model 1918, with its own amountion at which at a maximum elevation of 4.2 degrees fires a 200-pound propositie to a ranged 20,000 years This judgest and Tenfise to the propositie to a ranged 20,000 years The judgest proposities to ranged 20,000 years The judgest proposities to ranged 20,000 years The proposities to range 20,000 years The proposities to range 20,000 years The proposities to range 20,000 years 20,000 ye

mount permits of an all-around fire without changing the position of the mount on the tracks.

In addition to the above artillery, the Ordnance Department developed some mobile heavy artillery for transportation over the highways, and if need be, sore over the highways, and if need be, across the fields, quite independently of the highways. A very fine piece is the sight-inch howster mounted on a self-propelled carriage of the caterpillar type, so designed as to make the entire unit self-contained and adapted for quick mobility. The self-propelled carriage is designed along the same general lines as the articlery along the same general lines as the artillery tractors which played such a prominant part in the field operations of the Allied armies it is propolled by a four-cylinder, heavy-duty, tractor motor developing about 75 hors-power at 30 revolutions per minute. The design of this unit is such as to permit a few degrees traverse of the howiter to the right and left, as well as the full cloration of the poece. A small supply of ammunition can be carried on the platform of the gun mount, with a reserve carried on cargo-carrying "caterpillar tractors, sufficient to serve the howitser of battery of howitzers. This howitzer mount is capable of speeds ranging from about one to four and a half miles per hour, and is so designed as to require less than one minute to put it in hring position from road travel The total weight of the vehicle is approximately twenty-five tons, though on account of the large track area, the concentrated pressure per square inch is but slightly greater than that exerted by an ordinary horse Sufficient fuel and oil are carried to permit the vehicle to travel about ten hours under full load, without replacing the supply The new ordinance includes, also, an

eight-inch railway mount, with ammuni-tion car shell 200 pounds, range 20,000 yards, all-round fire

yards, all-round are
During a test the tractor gun climbed a
45-degrees ravine wall and developed a
speed of four miles per hour on level
ground, demolishing trees and shrubbery just as do the monster tanks

Five-ten Artillery Tractor

The five-ton artillery tractor, develo and built in large quantities by the Ord-nance Department, has put the horse out of business so far as pulling guas is con-cerned Deep mud, shell craters, sand or logs cannot detain artillery when pulled by this type of tractor. The Ordnance logs cannot cetain artisery week pulses by this type of tractor. The Ordnance Department has produced them in four sizes, namely 2½-, 5-, 10- and 20-ton capacity. Automobile engineers and auto-mobile factories with large production facilities made these tractors possible.

"Dreadnought" and "Baby" Tan

Tanks played the most decisive part in the later phases of the war, and the Ordnance Department, on a joint production schedule with England, brough tion senedule with England, brought out a 35-ton tank which, in its general appear-ance, is similar to the first tanks used by the British on the Somme This design, which is driven by an American 12cylinder Liberty motor, carries 12 men. Four machine guns and two ax-pounders Wireless outfit, by which communication is always had with headquarters, is a part

of its equipment.

"Machine Gun Cavalry" is the nam that should properly have been assigned to the American "Baby" or three-ton tanks, developed by the Engineering Division of the Ordnance Department Capable of a speed double that of a hors and with one man firing at a rate in excess and with one man nring at a race in excess of the firing of ten men with rifles, this type of tank saves the work and lives of many thousand soldiers. It advances against machine gun fire, and can pull guns as well as carry fighters

LEGAL NOTICES

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DIXON



Renault, the terror of the German machine senaut, the terror of the terman machine gun nests For quick transportation to the places of activity the ordinance engineers provided a rubber-tired, ball bearing trailer an American artillery tractor being provided to haul the entire outfit over any kind of roadway

9.2-inch Howitser and 11-inch Trench Morter

In addition to the artillery above enumerated we possess five 92 inch mobile howteers of the siegi type built from a British design, and it is now recom-mended that a total of 20 be completed This piece fires a 290-pound shell with a maximum range of about 10 000 vards and for traveling it divides into three loads of about 14 000 pounds each including the transporting volucle. We \$ have also gotten out a design for a 11 inch trench mortar with a maximum range of 4,500

The unexpectedly early termination of the war leaves the country in an excellent condition as regards its capacity for the condition as regards its capacity for the construction of all sizes of artility in the event of a future war. Many of the plants will of course be dismaniled but the great Covernment establishments for the manufacture of ordnance on a large the manufacture of ordinance on a large scale will be a permanent and immensely valuable asset to the country The Ordinance Department is to be con gratulated upon the way in which it rose to the occasion, put in operation the vast organization and built the equipment

Fitting the Shoe to the Soldier Continued from page 56)

the size by testing it with the shoe-fitting device—the set of metal blades—In reality this operation is employed in order t render it doubly certain that each man shall receive correctly fitted shoes

receive correctly attentioned in Each of these small metal blades is marked with a shoe mac—5'2 6 6'2 and so on When a pair of shoes has been relected for the soldier of the mac indicated. selected for the soluter of the miss indicated by the measuring device the operator inserts in them a pair of the blades of corresponding size, placing a blade in each shor. The knob end gors forward into the toe of the shoe and the other end is spring back into the heel

The soldier then puts on the shoes and laces them up snugly The blade in each shoe will lie flat and smooth in the bottom of the shoe under the stocking and will follow perfectly the conformation of the

The little knob in the too end of the sh The little knob in the toe end of the shoe occupies exactly the space which should be free space between the soldiers toes and the leather at the stid of a corredly-fittled army service shoe. Even when the foot has been expanded, by the act of the sol ders walking and carrying has load, there should still be a certain space between the loves and the marde end of the shoe because it is fundamental in the science of army shoe fit that under no circumstances should the ends of the toes be in contact with an

shoe fit that under no urcumstances should the ends of the tone be no contact with an obstruction of any sort. Pressure of free space ahead of the tone does not mean that the shoe is too long. The should be should be



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The saw most carpenters use HENRY DISSTON & SONS, Inc., Philadelphia U S A CANADIAN WORKS TORONTO CANADA



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We are prepared to build special michinary and models from most delicate precision instruments up to 10 ton machine ESCINERING AND PLANNING DEFT Best Equipped Plant of the hind in Country
THESE RIVERS MACH TOOL & ME CORP PROBRES H

ANY PLACE - ANY PACE - ANY CAR



"Why is the price of meat so high?"

THF head f a Philadelphia family writes 15 ask us why the price of meat is 8 d ligi



The heavy de mand for meat ceused by lerge orders from the Allies and by high wages at home wages at home has helped to boost prices. The lower purchasing power of the dollarhas also caused.

the prices of all commodities to increase

But one impor-tant factor is the high cost of pro-ducing end merketing ment all along the line from ferm to retailer

The retailer for example must pay higher wages to clerks and more for delivery service—in fact everything entering into store operation has ad vanced tremendously

And the reteiler has to get a much higher price for meat because he has to pay the packers more for it.

Wages of parking house inhorers have increased over 100 per cent in the mail three wears



The packers in turn are in the same position as the retailers Labor transportation machinery, materials — all items in the packing business—have mounted rapidly But here agent the peckers have to gat higher prices for meat when they have to pay such high prices for live stock

During the past four years cattle prices to Swift & Company advanced 74 per cent whereas the price received for beef by Swift & Company has advanced only 61 per cent during the same period

The farmers have hed to get more for cettle because it costs more to raise



Corn for example has doubled dur-ing the past four years, farm labor is scarce and wages are high

But even with these higher produc-tion costs, the price of meat has gone up no more than the price of other foodstuffs—and this in face of the enormous quantities sent overseas to our Army and to the Allies.

If the packers were to eliminate their If the packers were to eliminate their profits entirely, there would be prac-tically no change in the price of meat. Swift & Company's profits average only a fraction of a cent per pound of meat.

Swift & Company, U.S.A.



For Gunsmiths, Tool Makers, Experimental & Repair Work, etc.



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THE SCHWERDTLE STAMP OF SIEH SIAMPS LITTERS & FIGURES BINDGE PORT CONN

INSVDE TYRES to for Auto Tires Dunde scheme person descripts and personnel Emily smalled to see the Thomas and sold. Dunde from Apropo orbited Aroner Acceptances Co., people, S. Ciropiness

THE BRIDGEPORT CHAIN CO Specialists in Small Wire Shapes & Flat Stampings



Battleship Strength of the Pive Leading Naval Powers

the Kansas class and the five ships of the New Jersey' class. We have also eight ships of the 'Maine," "Alabama." and hearsage classes, mounting 12-inch

and 13 meh guns

It is considered that a battleship be It is considered that a battleship be-comes obsolite after 20 years of service and therefore the lows completed in 1897 and the 'Indians Massachu-sette and 'Oregon built in 1895 and 1896 must be reckoned in the obsolite class It-fore leaving the United States Navy-and passing on to the next three, we draw attention to the fact that because of the attention to the tact that because of the great size and power and resisting quality of our dreadnought ships they form a flest which under a single command is fully equal in strength and fighting power to a combination of the Japanese, French and

combination of the superior recombination of leaf superior recombination of leaf we wish, however very emphatically to draw attention to the fact that our navy, strong though it is in dreadnoughts, is very poorly balanced. We have no fast modern poorly balanced We have no fast modern scouts whatsoever, and these are absolutely commission in the strategy and tactics of modern naval warfare. We have six very modern naval warlers we have any very fine battle-cruisers authorised and partly under construction These should be pushed to completion, but we should immediately commence the construction of the 7,000 ton, 35-knot scouts of the should lay down a larger number of smalle and more handy type of equal speed, but of say 4 000 or 5,000 tons displacement Our officers who were with the British fleet k enthusiastically of a 35-knot scout of about 4 500 tons displacement mounting five 6-inch guns on the center line, and we hwe 6-nah guns on the center line, and we think it would be goed policy for our navy to lay down as early as possible at least a score of these in preference to the 10 larger vessels. We have authorized the con-struction of 10 dreadnoughs, four of them of the California type and the other ax to be of over 40 000 tons and carrying ten or twelve 16-inch guns. This program in common with whatever program Great Britain may have under consideration and primin may have under consideration and those of the other naval powers will come under consideration by the peace con-ference with a view to fair reduction on the basis of the respective requirements of the various countries concerned

During the war Japan has added aix ships of the dreadnought class to her fleet Four of these are battleships of over 30,000 tons displacement each mounting twelve 12 mch guns and steaming at 22 5 to 23 knots The other two are battle-crusers of 27 500 tons, mounting eight 14-inch guns and steaming at 27 5 knots She is also building a new battleship of 32,500 tons and 23.5 knot speed, designed to mount 10 15-inch guns upon which not much work has been done, construction

much work has been done, conseruction been stopped for the period of the war Of predreadnoughts Japan has 12 of widely differing military value Six of these are what might be called semi-dreadnoughts, masmuch as in addition dreadnoughts, massauch as in addition to their 12 gus, they carry a beavy intermediate battery of twelve 10-inch in the ease of the "Ak' and "fisharma," four 10-inch in the case of the "Kashima" and "Katori, and eight 8-inch on the "Kurama and 'Ibuk: The Japanese predreadnoughts are generally more modern than those of other nations, all of them having been built since 1900 and all having speeds of from 18 to 22 knots

The French News

The French ships completed during the war are three of the "Bretagne" class, 23,500 tons, mounting tan 13 4-anch guan. The French had hald down five ships of the "Normandie" class of 25,250 tons, mounting 12 18 4-moh guns in three 4-gun turrets, but they had done very little work upon the ships when the war opened, and

did practically nothing during the progres of the war Hence, the French nav includes at present only the seven dread nought battleships of "Bretagne" an

Remembering that a dreadnought ship includes nothing less than 12-inch guns in its main battery, it will be understood that the five French battleships of the that the five French battleships of the Mirabeau Ches which mount four 12- unch and 12-94-ind pura, example the considered available for the first scale of the considered available for the first Tailian "Vot Emanuele and the British Lord Nickon' classes these vessels must be resk coned in the predmadnought class which for the French navy inducts a total of 11 ships of obsolete vessels the French navy prosesses three

The Itelian News

Similarly to the French navy, the Italian navy had under construction when the war started some powerful dreadnoughts of which the keels had been laid but upon

which all work was stopped during the war These are the four ships of the Colombo class, 31 000 tots, 25-knot speed, mounting eight 15-inch guns. The five dreadnought battleships in commu-sion are from 21,000 to 22,700 tons displacement and 22 to 28 knots speed. One earries a battery of twelve 12-meh guns, the carries battery of threen 12-inon guns, the others a battery of threen 12-inon guns, mounted in three 5-gun and two 2-gun turrets It will be noted that neither the French nor the Italian navies have built any warships of the battle-crusser type.

Deterioration in Ultra-Violet Radia-1 tion of Mercury Lamps

THE reduction from the quarts mercury-rappr lamp are bung used extensively in accelerating photobomical sotions, as a bacteriside in sterilling water, as a therapeutic agent, in dy-rading tests, and in other connections. The violet and ultratherapseute agent, in dys-fading tests, and in other councitions. The violet and ultra-violet rays appear to have, as distinguished from the infra-red, a marked effect in many of these a tivuties. There has accordingly arisen among manufacturer of paper, dyes cirth, rubber goods, pants, ste, a distinct need for a ource of ultra-violent radiation of high intensity which does

not decrease with use

It is well known that the intensity of It is well known that the intensity of the radiation from quarts mercury-vapor lamps, especially as regards the ultra-violet component, decrease greatly with use. This decrease has been established qualitatively by several experiments, using physical, chemical and biological tests but no exact quantitative data have been available showing the rapidity and the extent of the loss in effectiveness, as a function of the time of operation of the

lamp
Some months ago the problem was presented to the Bureau of Standards Some months ago the problem was presented to the Burwan of Standards in attacking it it was first necessary, as is as often the case in the investigations of this Bursan, to device methods and instruments which would measure the deteroration quantitatively. The Bursan of Standards is quites in the habit of being Standards is quites in the habit of being the standards in the standard in th

to assuranced or whatever cles may be needed.

In the present case it was found possible to measure the ultra-violet radiation with a thermopule and a yellow glass. Several makes of quarts mercury-vapor lamps were examined, none was found to possess any great advantage over the others in point of initial scenage of the others are possessed as the point of initial scenage of the component was fruited to derive the component will be the component with the component with the contract of the methods used and the results obtained is given in Scientific Paper No 380 of the Sentence, just most of

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THE Pierce-Arrow factory is going at full speed. It will keep going and Pierce-Arrow trucks will be available for the great reconstruction work that confronts us as they are needed.

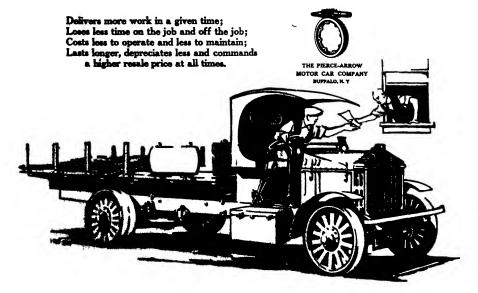
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Pierce-Arrow trucks will serve these—help them to conquer difficulties of transportation greater than those we have conquered. We met successfully every condition of service in 148 lines of business. Call on us for help in expanding or redirecting transportation facilities.

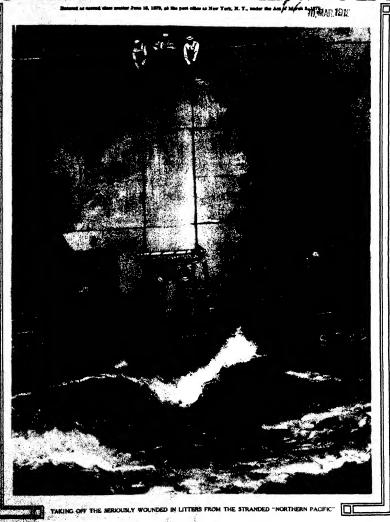
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Danier, Coe Paraltare Co.

Band's Transfer Co.

Band's Transfer Co.

Band's Transfer Co.

Band's Transfer Co.

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What PITTSBURGH Thinks of Republic Trucks

In Pittsburgh, with its hills and heavy hauling, where power and stamina are absolutely essential half of all the motor trucks in use are Republics.

"We found Republic Trucks so satisfactory in spite of over-loading and stremous over time service that we have just purchased another Republic say Best Company, manufacturers of pipes valves

"Because of the demonstrated efficiency of the first Republic we purchased, we are now using a fleet including 1½, 2, 3½ and 5 ton, all Republics say W E. Osborn Co, large wholesale produce dealers.

"In spite of the severity of service in the oil and gas fields and over difficult country roads our Republic Trucks have been absolutely troubleproof," say People's Natural Gas Company

"Even the additional abuse of war-time driving has had no apparent effect on the Republic Trucks which we have had in operation for three years They continue to give the most satisfactory service," say Ziegier Lumber Company.

Other examples of Republic quality and depend able service could be given without limit Each of

Rapublic Special with body

Modul 10-1 Ton with Express body

Modul 11-11/- Ton, channe

the owners listed in this advertisement and hundreds of others have learned the efficiency and conomy of hauling with Republic Trucks That is why there are as many Republic Trucks in operation in Pittsburgh as there are of all other makes combined.

In every city, in town and country — wherever motor trucks are used — Republic Trucks will be found, in constantly increasing numbers, performing hauling tasks of the most exacting land.

Republic Trucks are designed and produced by specialists who know the severest conditions met by trucks in any kind of hauling anywhere and provide ample strength and power to meet them.

More than 1300 Republic Service Stations, distributed all over the United States, insure prompt reliable service to Republic Truck users everywhere

There s a Republic Truck to exactly fit the needs of your business. See the Republic dealer and let him help you select the model which will best meet your requirements.

REPUBLIC MOTOR TRUCK CO., INC. Alma, Michigan

\$1.25 Mor I 12-2 Ton chassis \$2275 1535 Moral T-31/4 Ton ch ssis 3455 1885 Model V-5 Ton chassis 4750

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the Largest Manufacturers of Motor Trucks in the World

Westinghouse AND CONTROLLERS

Raising the Skyline

Story on story the steel framework of the office building lifts its lattice against the

Beam after beam, girder after girder, alips into place. Swiftly the skeleton takes form and becomes a many windowed mass of steel, stone and concrete.

But the mere building is not enough. Ready to give elbow room to an army of 15,000 workers, it must include means to carry them swiftly and safely to their offices. Its twentieth floor must be as easily available as its third. Reaching the street must be a matter of but moments, and little trouble for workers on any floor.

Yet few realize how necessary is the machinery of transportation that fills and

empties the many floors of the modern office building.

Without quick, sure, perfectly controlled elevators, no sane architect would design a building of forty stories

Without electricity, which alone meets all the power, speed and control requirements of the elevator, there would be no Woolworth Building, no Equitable Building, no Metropolitan Life.

Without electricity, New York's skyline would be low and level, and the whole thirteen miles of Manhattan Island's length would be needed to house its office workers.

Truly, the electric motor has been as vital as steel in raising the skyline to where it stands today.

Here, as in every other place of business, commerce and manufacture, for which dependable, flexible power is required, Westinghouse has taken an important part. Westinghouse Elevator Motors and Controllers serve today in many of America's best known buildings.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO. East Pittsburgh, Pa.

Brarting the symbles of greats buildings on their homeword trip—currying them up floor sites floor in the morning, is an enormous task even for an electric slewetor. Westinghouse Motors and Controller want to the service unfailingly every



SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION NEW YORK, JANUARY 25, 1919

REPOSITE UTRANSFAMILIA STRUBBLE POR

VOLUME CXX.

plan view A sound propostor is mounted in the center of the horizontal arm, as all win The entire apparatus in fastened to the bow of a ship as shown in the lower right-hand sketch.

It has submarine detector operates in the name general a manner as the serial apparatus of Mr Rise A sound a projected by the sound projector and the reflected sound or sello it assured, by the try, me authorize processors of the state of

manner as the serial apparatus of Mr Rice. A sound is projected by the sound properties and the reflected sound or each is caught by the tw. In gaphion resources only when they are positing toward the source of reflected sound. Thus the horizontal arm is swung about while the two megaphone receives ure moved toward and away from each other, until the rifected sound is loudest,

illustrations it is only shown in the original and simple form. The megaplionic can be titled downward as well as toward each other so that they oan be brought to lear on any object on a different plane than the horizontal arm. The awinging of the horizontal arm and the megaphone receiver may be effected from the bow by means of a simple hand control or mechanically or electrically from the bridge.

electrically from the Drigg In actual use the operator wears telephone receivers much after the fashion of the radio telegraphist. The horizontal arm is slowly swung from side to aide, while the sound projector is operated at intervals. When a

auspictours a ound is accupit or when an echo is received, the operation minodiately brings the horizontal arm into a definite position where the sound comes in boutdened to be sound comes in boutdened to be sound comes in boutdened to be sound, indicating that the best foom the sound comes in boutdened to be sound the range of the sound canning that the best foom means of suitable scales it is then possible to read the range and szact position of the submarine. Because of the homogeneous nature of water and the use of the reflection principle, Mr. range can be determined with the same source; as the conventional articlery range can be determined.

10 CENTS A COPY

tillery range-finder
Among the refinaments of this apparents
and the apparents
as the method of offsetting the pressure when
the vessel is on the
move The inventor
makes use of a simple
plot tube arrangement
which compleases for
of the megaphone daphragm by a counterpressure in the forward
phragm by a counterpressure in the forward
what the appeal of the
vessel may be, the presvessel may be, the presvessel may be, the presment in the pressure of the
result in the pressure of the
result in the condition is
practically the same as
and the condition is
practically the same as
and the condition is
practically the same as
in the vessel were standing still If desured, the

moguithones may be attuned to the sound waves of the projector, so that there will be practically no mereference from other sounds By means of a double contact button which disconnects the megaphors receivers when the sound projector is operated, the operator does not hear the projected sound waves until they are refutrituded by a reflecting surface. And since it is extremely difficult to draw comparisons by sound means only, Mr. Rue has introduced sensitive electrical devices which give a vasual indication of the comparative values of sound waves affecting each mega

For many reasons it may be best to employ sound waves
(Continued on was 22)

Submarine Range-Finding by Means of Reflected Sound Waves

AT best, submarine visibility is limited to a few handred feet Even with the most powerful searchlights and the most improved sighting means, deply submerged objects can be detected only within a 500-foot range, which, obvously is too circumsembed for practical purposes. And it is that very fact that has brought about the submersible fighting craft, which can steal up to its intended vottim, descharge the torpedoes, and get away without showing much more than its this persoops for a

brief mounant
But where the eyes
fail the ears can be made
to serve Early in the
anti-submarine canpaigs the allied countries set to work develpring the state of the countries of the
pring descripe the pressense of U-boxts. What sees and still remains a military secret,
although it is positively
known that most destroyers have been
earlipped with despite
the countries of the countries of the
earlipped with despite
"lydrophones." The
Cerman U-boxts have
also boen equipped with
electrical "earl," enabling them to hear the
various ships and submarines about them For
gove a broad unification
of the pressure of Uboxts and other orati,
and in no sense have
they been employed to
locate the exact wheresource of the sensory.

When the United State entered the war, and when the U-host ompasjar was practically at its height several American inventors act to work on the submarize detector problem. Among them was Mr. Zilas Rice, an electrosis engineer of New York otly, who worked out a submarine sound-detecting apparatus of the type shown is the se-

submarine accordance of the type shown in side accompanying crawings.

Mr Rass will be resalted by the constant reader as the mreator of the gestern of serial. "ears" for mariners, which permits the sources positioning of scaberg, andmarks, where also are on undergother thickness (ope, and whick was described in these columns some

when I want to meeting hinders submarines, let's. Has morely specified his series appearation on so to make it wealthing for one in water. The result is shown in the least densities, "I submarine appearation opinions of two members densities," I make it provided at the united of a first members. The latter members may be virtual of a first members of the control of the control of the con-



By means of this device, which was originally developed for the detection of U-boats, the mariner is able to issue wasks, nacharited rocks and other submerged objects

mdiscature that the appearatu is almed with the source of the rebounding sound waves Now if the axial line of each negaphone servive; is axiomed the two lines will obviously eroes at the point where the rebounding sound waves originate. And with a base line (the arm) of lenow length, and with the base angies (formed by the position of the megaphones as compared with the harizontal arm) also known, it becomes merely a matter described by the position of the second source of the two lines, which is the appear of the seconds triangle that formed.

This type of subsectine detector has been developed to a fine degree by Mr. Ries, and in the accompanying

SCIENTIFIC AMERICAN

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Charles Allen Munn President Ore D M nn Treasurer Aliar C Hoffman h ctury ali at 233 Br adway

Entered at a 1 st (fine f New York N 1 as 1 loss Matter Trade Vark (tests red) t e 1 ntel State 1 a nt ffice (yright (0)1) y f (American I that (s) c (first litt) g to rever at 1 little (s) the control of the cont

The object of this 3 urnal is t rece t ac uritely and

lucidly the latest eccentific mechi icil and industrial news f the day. As a weekly juri il it is in a pesi tion to announce interesting decelopments before they are published elsewhere

The Filter is glid to have submitted to him timely arts les suit ible for these columns especially when such articles are accompanied by photographs

Port and Harbor Facilities

NI of the most important papers presented at the War Emergency and Reconstruction Congress at Atlantic City in December last was one bearing on the very serious question of the Port and Harber Facilities of the United States | Ihis matter is very intimately related to the question of the greater American increhant marine which is now in course of construction

The strange national complacency with regard to the absence of an American merchant marine disappeared with the withdrawal of hundreds of thousands of tons of neutral and German shipping from our commerce and with the massivat demand for 1 stroms resulting from the enormous purchases of munitions and war supplies by Great Britain France Russia and Italy Manufacturers were hurrying shipments to the Atlantic ports, regardless of the dates of sailings of vessels and the lumited storage facilities at those ports Wharves docks, freight yards, warehouses, etc became choked with freight and for miles behind the subboard sidings and tracks were congested with loaded freight cars

The solution of the problem was sought in the two directions of building a large merchant fleet and of increasing the efficiency of the port and harbor facilities Investigations by the Shipping Board showed that the dry docks were utterly inadequate to meet the needs of the ships in use, that the methods and appliances for loading and unloading cargo in the majority of the ports were inefficient, that the marine terminals were insdequate and that there was no co rdination of towage and lighterage facilities As the result of its investi-gation, the Shipping Board created on May 23d, 1918 the Port and Harbor Facilities Commission

Careful study of the various elements entering into the export and import trade of this country has convinced the Port and Harbor Facilities Commission that one of the most important factors in the upbuilding of our maritime commurce is the adoption of a soming system under which exports and imports will flow through those ports which are within economic trans portation distan : of the points of origin and destination Knowing the point of origin of a commodity the deterministion of the port through which it should be exported does not by any means depend solely upon proximity and railroad facilities. Other factors enter into the question such as the per entage that is exported of the total of a commodity that is mined manufactured, etc at a given point Statisti s tell us the total amount of a commodity exported the 1gh our various norts, but we have no statistics showing the proportion of the total exports distributed by the several points of origin Thus we know that in 1914 Illinois produced three times the amount of agricultural in plenents that was produced in any other state but it does not follow that the same proportion obtains it regard to exports That is one of the subjects which the Commission now has under investigation A like con litt in obtains in respect to the destination of imputs Statistics tell us the total amount of each commodity received annually at each of our ports, but we have no data as to the destination of these commodities I his is a matter of supreme importance, for the success of a port depends on its ability

to maintain an economic balance between its exports and its imports. Thus, a port may be the nearest point at which a vessel can unload, but if it cannot provide a return cargo, the vessel will make another port at which such cargo can be obtained. The Commission is now engaged in determining what proportion of our export trade originates at each of the important centers of production, and to what points our imports are distributed With these statustics tabulated, the Commission will be able to establish an economic soming system

The congestion at the North Atlantic ports was due mainly to the fact that 75 per cent of our war industries are located east of the Alleghany Mountains and north of the Potomac and also to the fact that the Allies being our largest purchasers, there was an unprecedented movement of freight to the Atlantic sonnorts

The use of pier transit sheds as storage warehouses has en a serious handicap The Commission recommends the construction of adequate warehouse storage facilities, inshore and adjacent to the transit sheds as the most effective way of mereasing the efficiency of the marine terminals

It must be understood that the Shipping Board does not possess any authority to finance the improvements necessary in the various harbors of the country and it believes that the best guarantee of the success of a port is the investment in its improvements by those who be benefited by the resulting increase of its business To this end the Commission has urved the municipal officers of all seaport cities to so perate in the appointment of Port Commusions, whose functions will consist in stimulating interest in maritime commerce in their everal communities and in the territory tributary to their respective ports

When the ships now in course of construction are completed, there will be approximately 17 300,000 dead weight tons of shipping under the American flag That tonnage will call for a very large equipment of dry do and marine railways-in immense undertaking in itself Furthermore, the Commission is recommending the extensive introduction of modern, improved appliances for the loading and unloading of freight

We can well believe that each step taken by the Port and Harbor Facilities Commission in the course of its investigation has served to impress it with the importance and magnitude of the task with which it has I betrusted

Compared with our wealth and our vast and evergrowing commerce, our port and harbor facilities are woefully inadequate, and in our great effort to build, in a few years time, a merchant marine which normally would call for several decades of growth we must not forget that our port facilities are also far below requirements and that they must be enlarged improved, and thoroughly modernized, contemporaneously with the construction of our new merchant marine

Our Achievements in Aviation

TITH the raising of the ban of censorship, the story of America's effort in the air can at last be told in its entirety It is a remarkable story, for it tells how the United States, in the brief space of a year and a half of war, established a gigantic a nautical industry, built up a huge fleet of airships of all kinds, trained an army of airmen, and developed a standardized airplane engine as well as several all-American types of airplant

named for Major-General George O Squier, Chief Signal Officer of the Army, to give us real facts and figures concerning our aerial activities. This he did during a recent address before the American Institute of Electrical Engineers in New York City The facts and figures given below are his

At the outbreak of the war we had a negligible size fleet, comprising a handful of training planes and about as many trained fiters. There was no real aeronautical industry Our aeronautical engineers and dougners were so few as to be negligible But once we entered the war, our Government immediately realised the importance of aviation The \$10,800,000 appropriation granted in the act of May 12th, 1917, the \$31,848,600 and finally the \$840,000,000 left no doubt that we w

As to what has been done, we first learn that 8,806 fliers have Been trained in this country since the war began. Monthly graduations at the figure schemin have constantly increased. Figures give our insisting faidfilled to be less than those of any other country. On the students have flown more than 880,000 heave, which is the equivalent of 66,000,000 miles. The monthly average in the United States has been only one faightly for each 5,300. hours flown

More than 16,000 Liberty engines were produced in the calendar year 1918. To November 11th, 1918, soore than 14,000 Liberty engines were produced, equivalent to 5,700,000 brake horse-power

On November 11th, 1918, there had been developed, tested and adopted by the Army four airplanes, on which production would have started this year. They were the Lepere, the De Haviland 9-A, the Martin twin engined bomber, and the Loening two-seater fighter The first three were equipped with the Liberty segme, while the last carried the Hispano-Suiss engine also being turned out in quantities

To turn out the vast number of machines shipped overseas, an industrial army of about 350 firms an corporations, employing more than 200,000 men and women, had to be mobilised. A cotton fabric had to be developed to take the place of the linen formerly used for airplane wings. Huge lumber camps had to be organised in the Northwest, in order to obtain the spruce and other lumber required

Meanwhile the Navy erected the large Naval Aircraft Factory for building its own planes It developed a huge flying boat, equipped with two Liberty engines, for anti-submarine, convoying, and coast-patrol work It developed a still larger flying boat, equipped with three engines, which recently carried 51 passengers

Many achievements were scored in the research field Our chemists worked out a commercially practicable method of obtaining non-inflammable belium gas for balloons and airships, thus placing these lighter-than-air

craft on a more equal footing with the airplane type
All in all—and the foregoing is only the barret outline of what has been done—our record in the air has been one of the greatest supprises of the war.

Electric Waves from Ocean Tides

BSERVATIONS which indicate that there is a subterranean electric wave analogous to the ocean tide and derived therefrom have been made at the St Louis observatory on the Island of Jersey, and recently reported before the French Academy The iron pipes which deliver gas and water, respectively, to the observatory, on being tested by a sensitive galvanometer showed istence in the ground of an electro-motive force of 0 1 volt, whose variations were registered photographically through a period of ten months. In the opinion of the observer, M. Mare Dechevrens, the current is evidently ted by action of the moon, through the oceanic tides

The voltage exhibite a maximum value twice a day and a minimum value twice a day, the two ceciliations are almost equal, like those of the level of the sea.

The entire variation is accomplished in about twenty-five hours of solar time, the maxima and the minims for any given day therefore comurred 50 minutes minims for any given any secretors quantum on hautrees later than upon the day before. This is precisely like the daily retardation in the passage of the moon to the meridian and like the daily retardation of the tides.

If it is really the movement of the waters which is the origin of the electric current observed we would not expect to find the maximum voltage concurring with high The manmum electro-motive force may be seen nected with low tide, preceding it by two house,

The maximum amount of attraction upon the water by the sun and the moon acting together takes place at the time of the equinectial new modes. At Jersey, the highest tide which results from this action in concert is not produced until after the lapse of an interval of 40 hours and 30 mountes on the average. The greatest variation in the electro-motive force at the same period is registered as a minimum of voltage about 38 huggs and 30 minutes after the rise of the new moon, or two house

be discussed and the state of the year.

During the development of the state at James the sea vises during a period of 5 hours and 40 minutes to Rel. In the size of the state the decime current the intervals of time which most closely second with those of the title area 5 hours and 28 planutes for the diminution of the voltage and 7 hours and 15 minutes for its increase.

Electricity

A Simple Cuttle Clement as bein in use for ricustine posit, in Clement and other European countries. It possible subjectly of a flat metallic tube in which a series of notobes are made with a special tool after the two conds of the cubic too joined are properly inserted The contact is said to be perfect, and the grip is such that the cubic breaths before the connector gives well.

Wireless and Morale.—Sunce the armistice brought homilities to an unit has been larged that the morals of the population of Life was maintained by never given from a French wireless station hidden from the Germans according to Wireless Age Good news syraed quickly through underground channels. The people knew that 18,000 Amerones seldiers were surviving duly. Airplance also dropped many leadets, whole were eagerly taken despite German efforts to prevent their distribution.

Efficiency of the Moore Light — A contribution by M Wolfke to the Bulletin of the Association Susses des Electricians refers to some tests carried out on a Moore tube installation using earbon doxide gas Figures for the consumption varying from 47 to 60 watts per befrare-candle are given and it is shown that the former was appearedly a manipum when the matallation consumed about 2 000 watts — in the case of tubes filled with stricgen the efficiency as much better about 1 to 2 watts per hefuer being recorded, while the Neon tube operates at less than 1 watt per hefuer. It is known also that the efficiency of the CO-Moore tube can be matern ally improved by mirchodings a choker in the primary climits with a view to producing a modification in the form of the ways.

Betteich Radie Telegraph Schemes —It is reported that various schemes are under consideration for the development of radio-telegraphy throughout the British Empire particularly in the Far East the Penofic, and the West Indies It as proposed to establish stations at Sigaspore Colombo and Hong Kong that Ill be able to esemintiests with the systems about to be established to seemintiests with the systems about to be established in China and with those stream of winting in Japan. The stations to be established in the Southern and Western Pendife will some into line with the Australian and New Eschand systems. Some of the islands of the British West Indies are shready connected by radio telegraphy but it is proposed to extend and improve the system so only the state of the state

Riveties Ships—The Committee of Lloyd a have recently earlied out a series of experiments to determine as far as can be done by means of tests and analyzes the general trustworthiness of structural connections effected by electric welding and their capacity to stand the strains to which they would be subjected in practice. The Committee had before them the report from the society and to sessife them in their dollberations a demonstration was given at the society's offices. After careful consideration, the Technical Committee fordied to recommend to the General Committee fordied to recommend to the General Committee for approval certain recommendations put forward by the Chief Ship Surveyor as all the conditions on which, as a tentative measure, welding night be adopted instead of riveting in the construction of vessels intended for classification in Lloyd's Regular Book.

Bisenceptacing to Balence Shalls—According to Uses, in most muscine work there will be found in spite of the case of the mechanical processes, a certain number of habit that are held by balanced I? is destrable, if possible, to save such shells, and variests methods of recovery the balance have been tend for example sachs have been conjuged to reduce to transplatines and layedwar excitan dangers in mentionation. A bester mostach, but this gives rise to impossible the same layedwar excitan dangers in mentionation. A bester mostach, which has been more recently engaged to the disposit a method account of the same point by a simple observable model of the same point by a simple observable model of the same point by a simple observable model of the same point by a simple observable model of the same point by a simple observable model of the same point by a simple observable model of the same point by a simple observable model of the same point by a simple observable model of the same point by the same point of the same point o

Science

Expansion of Insulating Maxerials—During the part year the Bureau of Standards has tested and hear treated a number of synthesic insulating materials such as baselite condensite formus etc. in order to sottam information required in connection with the Bureaus spark-plug investigations. The tests show that without exception the sit since above mentioned are usualitable for use in delectar as paratus which may be subjected to temperatures above 60 deg C. The thermal expansion soon vanishes and continued treatment shows marked contraction and loss of weight of the specime. The Bureau will publish a paper on this subject

Branch Hydrographic Offices in War Time—
During the war the various branch Hydrographic Offices
of the Navy performed a large amount of special work in
addition to their routine duties of collecting and disseminating martition information. Five of them were engaged in recruiting and circ lling four gave instruction
in navigation to Reserves as Anvaid Mittat others cooperated in navial intelligen or wisk purchase of sex
tants compass inspection cable censorship and the
Eyes for the Navy movement whish resulted in their
bosaides numerous other instruments as loans to the
Navy.

New United States Life Tables -In the year 1916 the U S Census Bureau p blished a collection of life based on the census of 1910 and the mortality in the three years 1909 1910 and 1911 for the six New England states New York New Jersey Indiana Michigan and the District of Columbia These tables were similar to those prepared by his insurance companies except that they related t tl store population of the area covered instead of bong limited to risks selected through medical examination (r otherwise. The Bureau now announces that it has ready for publication a new series of similar tables exhibiting mortality conditions in 1890 and 1901 and duri g the decade 1901 to 1910 inclusive In connection with certain tables there will be given commutation columns and data as to annuities and single and annual premiums at various rates of

New Quarters for the Hydrographic Office -The hydrographer of the Navy in his last annual report calls attention to the urgent need f ni w and permanent office accommodations for the Hydrographic Office Like so many other branches of the (overnment the Hydrographic Office is now domicaled in rented rooms which are both crowded and ill-adapted to the work carried on In this connection Admiral Schroeder revives the project of consolidating the Hydrographic Office with the Naval Observatory : e a return to the arrangement that existed prior to 1866 and notally in the days when the achievements of M F Maury shed lustre on these two establishments of the Government The lease of the present quarters expires in 1923 which would be a favorable time for the proposed an algamation The hydrographer s plan is to erect a building for his office in the Naval Observatory grounds where ample space is available

The National Physical Laboratory the leading establishment in Great Britain devoted to scientific research has grown so rapidly under stress of war require ments that it now has a staff of 532 as compared with 26 in 1902 The last annual report although as in previous years since 1914 chiefly notable for the tlings that, for military reasons it omits to mention is an impressive record of strenuous and valuable work buildings are in course of construction to provide facilities for manufacturing a certain class of gages and for testing glass vessels for chemical work—both undertak-ings being on behalf of the Ministry of Munitions The number of munition gages tested at the laboratory has amounted to nearly 16,000 a week Additional large au channels have been required to meet the demands of the Air Ministry More than 8 000 chains thermometers have been tested per wask. Three new clinical test baths have been provided, each having a capacity of 600 thermometers a day Under the head of option buildes concevers a cay concever the need of option beadest couldn't steeling on a large scale important work has been done in testing the refractive properties of option glass and in simplifying the calculation and design of optical

Aeronautics

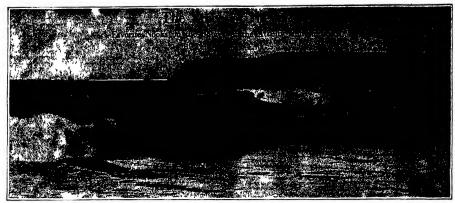
Alrysams for the Sportaman—Now that the unitary avastor is returning to penceful jursuits there are many who believe that he will not give up flying Indeed there are a veral aircraft instructors who it aircraft of the strength of the property of the section of the offenings is it if rm if a smill big it designed for the niam who ril is his ranch in tid the ini wholoves the air to quote the manufacturer so inno inemet. It is known as the Dispatch Model and sells for \$2.000. The factor of saf ty is said to be high while the cost of upkeep is low.

Weather Forecast for Filters—The first aerals weather forecast to be assued in the United States was made public recently by the Weather Bureau in copperation with the serial mail service of the Post Office Department. It was as follows—New York to Cleve Land cloudy 8 P M Snow near Lake Erre Win is moderate northwest to north northwest east of the moderate northwest to north northwest east of the Mileghanes up to 6 500 feet and moderate south winds west of Alleghanes shifting to west southwest at all out 1500 feet. Porecast snow today Monday with in creasing northeast to north winds up to about 0 000 feet in the property of the company of the New York to Cherago mail service inauguration of the New York to Cherago mail service between those and intermediate cities it is understood that the forecast is to be extended to all the territory covered by the engaged nostines.

German Aircraft for Peace—From such reports as have reached us snoe the agming of the armster it appears that the German are bent on making the most of their huge accommutate a testing the most immediately after the armster was sugned the Staken plant located near armster was sugned the Staken plant located near into commercial mechanes. The Germans have made it into commercial mechanes the Fig. 1 of the fighting planes on handing the sum of the staken plant located near shown to the entire world that they intend linking up all the European capitals with Breim Already dozens of planes built entirely of aluminum have been trans formed for an oxionsive arrail postal system it is said that a huge machine is bring built at the Staken works for a transatiantic sight. The mechanic has a wing-spread of 198 feet and its multiple-engine power plant developes 3000 horse-power.

The Race to the North Pole -It seems that Captain Bartlett is not going to have things entirely his own way in his airplane expedition to the North Pole for at the present moment the British are also planning for a similar undertaking So the similane expedition may take on the complixion of a sporteman like air race with the Americans represented by Captain Bartlett and the British by Salisbury Jones of the British Northern Exploration Company Cantain Bartlett contemplates going to the Far North by way of North Greenland while Mr Jones is going by way of Spitsbergen which when reduced to mathematics means that the Americans will have some 2 000 miles to go while our British cousins will have only 900 miles of journey Mr. Jones believes that his expedition can make the flight in about nine hours

An American Passenger Carrying Record -Recently the NC-1 a U S Naval scaplane broke the world a record for passenger earrying by flying with 50 passengers at the naval air station at Rockaway N Y No special modifications of the plane were made for the flight which was intended to demonstrate the machine s lifting power The NC-1 is the first American tri-motored seaplane She is of the flying boat type with wings having a spread of 126 feet With th low-compression Liberty motors of 385 horse-power each the huge scaplane makes a speed of about 80 miles an With the 50 passengers the scaplane developed 72 miles an hour It is not believed that this record will long endure for there are many giant airplanes and seaplanes now ready for flight or almost ready which will soon challenge the present record The day of the large beavier-than-air machine has arrived and the petition seems to have swung from the lighter and faster schines to the large weight-carrying machines After all the latter are the ones that have a true commercial value which accounts for this change in effort Caproni the Italian exponent of huge machines is reported to have a triplane of 2,100 horse-power which should carry about 70 passengers, while another rapidly nearing completion should carry 100 or more passengers



The surf at the entrance to San Diago barbor

ONF of the most beautiful sections of our Atlantic coast is that of the north short of Massachusetts Extending from Nahant to Cape Ann and beyond to the fast nating sand dunes of Ipswith may be found a sur prising variety of delicately curving beaches rocky pine-clad points and brown wave-swept reefs and ledges over which the sea mur

reas and lodges over which the sea mur-murs softly in summer and storms wildly in the great gales of a northern writer. At Swampsott-ty the Sea one finds a charmingly varied coast line with hold forbidding chiffs and wooded hills. The view from the tower of Phillips School is of surprising extent and beauty Beyond the slender finger of Lincoln House Point the sleader finger of Lincoln House Point is anchored a remmant of the fleet of schooners that in former days sailed to the Grand Banks returning laden to the water e edge with cod haddiok and hali but I a the distance Egg Rock rises boldly from the ocean irear the long pennants of Nahant while on the horize a the South Shoen of the Lower Lincoln Lin Shore often looms in fanciful mirage White sails gleaming and constwire steam white sails gleaning and consume steam ers training long ribbons of smoke pass ii and out of Boston harbor. Across the water are the spires of I ynn and beyond are the towers and domes of Boston Landward the eye rosms over a vast forested area of rolling hills while the north affords a glimpse of Salem and the sea

On the beach among the clam shells and lobster pots On the beach among the sams shells and sobset pois on may find the masters of many a long-departed vessel ready to spin their yarns of storm and shipwised. Dor-ies laden with the morning a saith of fish or with men-returning from the note are constantly arriving and on the bay the sails of pleasure craft are fitting back and forth before the breese. The summer visitors stroll along the beaches in the sumshine or loter in the meonlight when the sea is calin, but none are here when the storms of winter sweep in with sudden fury from the



The surf from the backwash at Coronado

broad Atlanta: In the southeast gales the waves come short and choppy breaking in while-cape far out upon the eas but the full power of the cosan comes majestically with wind and tide in the great northeast storms whose mighty waves roll in unbroken to the shore

Sometimes twenty or more feet in height, they tumble one upon another, changing from green to frethy white and singing with ten thousand voices which the wind gathers into one bearing it inland over the snow for miles

and singing with ten thousand voices which the wind gives into one bearing it inland over the snow for miles Reprefully must one rely on memory to picture the suppose of the property of the must be made in an instant, for in the next moment one may find himself amid the seawed and driftwood wast-deep in the bridy sea Often one must steal far out on trescherous wave-washed rocks in order to look shoroward toward the spray-covered chiffs One has not only to watch for and to capture the wave at its instant

of highest ascent but one must also note from the corner of highest ascent but one must also note from the corner of his eye the approach of a billow likely to engulf him Often have I struggied agenct a gale that threatened to huri me rato the foarming cauldenn of the see, grouched to awalt a moment of sunshine at the right instant for a



Where two seas meet on the Lynn breakwater



The surf at Little's Point, Swampoosti

picture, only to be forced to run for life from a rear attack of which no warning had been given Happy is he who can outdustance the wave, for the attenuative as to eling desperately to the rocks while seeming tons of spray drench one in a

wnothering my downpour

What inexpressible joy is mine on sunlit
mornings to wander alone along the shore marnings to wander alone along the shore responding with all my being to the great waves soaring mountain-high upon the rocks in radiant foam Deep oreany froth is spread upon the water and the air is tild of be sublime nuise of the sea. Even in mountaineering I have found no grander manifestation of power than that of the awakened sea. The wild fury of the manifestation of power him that the symbolium of the sy Even in mountaineering 1 nave ioung no grander manifestation of power than that of the awakened sea. The wild tury of the avalanche, oppending its energy in a few brief moments as it sweeps all life from its pathway, is less impressive than is the measured attack of wave after wave rolling in from the ocean to brank upon the cliffin From the ocean to break upon the cinris in ever-changing forms of beauty and wonder. What exhibitation there is in watching these great upshots of spray mounting higher and higher with the in coming tide until they call forth one s deepert shout of admiration and one a keenest longing to them he to worth another. Sometimes the and is heart.

share his joy with another Sometimes the surf is heavy, attacking the rocks in solid masses and forcing the very air to vibrate with its intensity Again at nightfall air to vibrate with its intensity Again at nightfall bleak and chill, the eur't towers ghostly against the leaden sky and the wail of the wind sends one shivering on his homeward way

on passeful evenings at Ocean House rocks, the deep orange moon sparkles softly upon the velvet waters while the red eye of Egg Rock gleams across the bay and beyond are Boston light the Graves and Minot's Ledge flashing intermittently in mathesit of grows the property of the control of the In northeast storms the great green rolls break upon these rocks in magnificent avalanches of pure white foam Unfor-getable are the seasoppes in which the enormous globe of the sun sinking in a purple sky glows with deepest vermil parly and common painting an indescribable pathway of brilliant changing color across the foaming water Surpassingly beau tiful is the iridescent mirror at the pathways ending on the sand Fach wave spreads a fairy film of creamy white and green upon its surface and retreating, wakens the hidden fire of a million opals. In summer one may clamber over the

rocks from Galloupe's to Little's Point in rocks from Galloupes to describe the seasons assertly poeming into the ocean gardens where the dark red and brown masses of the seaword rise and fall with the swell and the long ribbens of the kelp wave to and fro Crabs and fishes roam at will rise and fall with the swen shall save to and fro Crabs and fishes roam as was amid these forests and in the tuny pools left by the tide the star fish linger. See gulls ride upon the waves or eather in noisy confusion upon the roads.

beaten sails of the fishing schooners Bringing sweet odors from the wild rose and the bayberry the wind wanders along the point nodding the thick rich sprays of the sea-loving golden-rod Red and brown are the grasses brown and red and gray are the wave-worn ledges. To the artists eyes they glow with color like flower fields of rich orange and delicate draws a system to your wint common flower fields of risk orange and delivate and A low tide their sides are shanged their sides and their sides are should be should be shaded to be said their sides the published up and drown. Delivate so momes of white and purple of green and red, are seat up by the wares which curve in stately deliberation as they break upon the share. Further on is the quasin old town of Marthdeband. If you have not followed its narrow and winding streets, studied the encose legands upon its share sides and flashichead, Nesk, you have long aventure.

Wing you.
In wilder portions of the Swamp
of he wilder portions of the Swamp
of he wilder portions to brave the
street. Charlous days are then
the disrubbling beach of the se



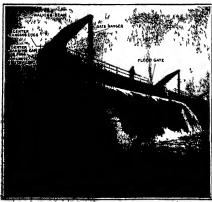
The height of a storm on the Massachusetts cliffs

the cliffs Terrible nights are these in which the air is the offine Terrine ingine are these in which one air is filled with binding sleet a d sn w and the sea with lagged ice and wreckage Tearn g the scawced and the kelp from their moorings gath ring the driftwood of countless wrecks and even se zing the stones in their



A winter-time view of the automatic flood gates, showing them

pathway the waves hurl them all with uncontrolable fury against the cliffs Moul tains of foam rise grandly over a hundred feet in the air the ground on which one stands seems to tremble and only with the utmost diffi oulty may one avoid being swelt away by the gale



Section Strongh the actions it food gate showing, by detted line, its

Many the hapless schooners seeking the port of Buston that have left their whit ened timbers strews along this shore Many the crews that have fought in vain for life escaping the cruel rocks of Nahant only to b driven by the gale a ross the bay into the jaws of death or these dread ledges Or terril winter night and the enveloping d rks as of a great blizzard a bark from Sp. ame laden with wine seeking safe harl r at Boston losing their reckoning dragging their an hors helplessly await is thir door all the sailors reached their fi isl haven that night The following day that I add a were found rolling in the snow filled surf by their comrad's of the sa the Swampscott ishern a Across the outlying rocks were the anchor chans f tle bark and amid the wrickage was its name. Tedesco Long years have passed and over the sea have sw pt unnumb red storms but still. on wintry days between their games of chess and checkers the fishermen tell us wly these rocks are called Tedesc; a little later the I red Bliss bound for Boston from the same port as the was driven one night high upon the maily

rocks of Galloupe a Point fortunately the all but frozen crew were able to make their way to land where they brok into a summer cottage and found safety until the coming of morning

To love the sea and to respond to its

' Tedesco

varied moods is to find enlargement of soul Its silent depths have claimed the hopes and the lives of an unnumbered multitude Are there not hours in which one may hear it voice the mingled joys and sorrows of a common humanity? sorrows of a common humanity? In the listening soul the sea is a wondrous harp on which the chords of life sound clearly

The scenery of the California coast is always delightful whether we wander over the sand dunes and morning glories of Point Pinos among the wave worn cliffs and gray cypresses of the Monterey peninor in view of the purple mountains Santa Barbara Unknown to the at Santa Barbara Unknown to the North Atlantic coast are the wonderful blues and indigoes of the water the flying (Continued on page 82)

Flood Gates That Take Care of Themselves

AT Nashua Iowa there is a very interest ing dam which impounds the waters

A in gam which impounds the waters
of clear River for a hydroelectric plant
for dam is a concrete structure 17 feet high. The
most interesting feature as the means of keeping
the water at a constant level back of the dam
ceder River in time of flood rises rapidly and has
a very swift current and so flood gates were insaid in the dam which would open auto-

matically in proportion to the increased pressure of the water and prevent an excessive rise of water back of the dam. The Switzerland where such structures are not uncommon It consists of a pair of gates, each hinged at the bottom and connected at the top to a pair of walking beams

counterweights of concrete
I ach gate is 46 feet long and is arranged to hold back a constant head of 7 feet When the water rises the gate swings down and the counterweight is lifted To compensate for the increase in leverage of the outwardly swinging gate the fulcrum of the walking beams is correspond-ingly advanced. This is effected by the use of toothed wheels on the beams, engaging racks mounted on the concrete buttresses of the dam so that a rolling fulerum is provided A certain amount of adjustment is furnished in the means of attaching the counterweight to the beam Cam links are provided as shown in the accompanying drawing with a number of openings at various distances from the center in which the connecting pins may be located

The gates are of steel covered with wood slanking, and leather is used to prevent the water from leaking through the hingc joint and also around the ends between the planking and the buttress walls

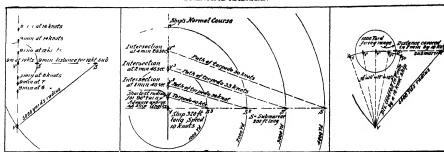


Fig 1 biffect of error in speed—estimate on authorize's maneuver for position

Fig 2 Path of the torpodo when fired at various ranges of in these three drawings 8, 8' ac - submarine v v' ac - the shir

Fig. 3. Effect of error in course

Curved or "S" Courses

A Protection Against Torpedo and Gunfire

EARIY in the war ships were accustomed to steer a straight course and formed an easy mark for the submarine but in 1915 all the allied nations adopted a method of steering on zigzag courses and this proved to be probably the most effective of all the many devices to clude the torpedo During the course of the war Mr Lindell T Bates Secretary of the Submarine De-fense Association devised and patented a method for enabling ships to steer on continuous curved courses in which there would be no straight course whatsoever This method is an improvement upon the rigrag course and is a logical development of its principles. The Submarne Defense Association rountly with on record with the statement that This more than any other invention of the war time will ad submarine defense and profoundly affect coast defense armanent and naval tactics

In order to reach a torpedo firing position the sub-marins must submerge at a considerable distance and proceed under water until she comes within firing distance. This firing distance should be not over a thousand yards. Indied during the war because of the difficulty of hitting the Cerman U boats are said to have received on attend the certain to loads are said to have received instructions if possible to get within 400 yards before letting go At a range within 1000 yards, if the torpedo is fired before the vessel puts her helm over, there is but little chance for her to avoid being litt.

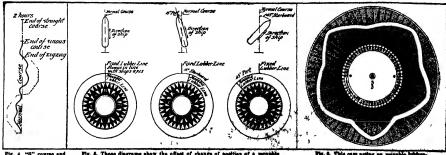
For a torpedo firing position within a 1 000-yard range to be reached and a torpedo to be aimed with accuracy, to be reasoned and torpied to be aimed with accuracy, the submarino captain must learn three things (1) the course on which the vessel is steaming (2) her speed, (3) and the range or the distance between submarine and ship With this data the problem becomes simply and ship. With this data the problem becomes simply one of the solution of triangles in whith the bearings and range of the ship and U-boat speed of the ship and the torpedo and the angle of torpedo fire are utilized. The object of this calculation is to fire the torpedo at a point ahead of the ship so that it will cross the ship's course at the time when the ship reaches that point

Effect of Maccalculation of the Ship's Course, 2 and Derivace

The effect upon the success of a submarine's maneuver for position of an error in estimating the course, speed or range of the vesses, may be very super-may be seen from Fig 3, an error in course—estimate of from 10 to 20 degrees, in a direction which carries the vessel toward the U-boat while the latter submerged, is to the course of the reaction—may result eed or range of the vessel, may be very important vessel toward the U-foot white the letter submerged, as approaching the 1000-yard fring position—may result in the submarine, on emerging to make corrections finding itself so near the ship, that it will have to remain under water to escape guafire and the depth bozzh. It the submarine makes as error in course-estimate which carries to vessel away from the submarine, the latter on emerging will be so far from the ship as to be outside of torpedo range. If the submarine overestimates, the speed of the vessel it can upon coming up for observation await of the vessel 1 can upon coming up for observation await the ships a rarria or maneuver closer but if the U-boat underestimates the ship's speed, she will on emerging find that the ship has passed the descred firing position. This will be clear from Fig. 1. If the range or distance to the submarine has been underestimated, the opportunity for torpedo attack may be lost. A serious overseitments of the durfance may bring the submarine too close and expose her to being rammed and sunk by fire and death boards.

and depth bombs Now the estimation of the course upon which a skip is steaming and its speed are necessarily difficult to make with certainty. A series of observations is made at successive intervals, and it is the object of the various forms of camouflage tending to produce optical Illianous as to the fore and aff axis of the skip, to running under water for a grava time and coming up for a final peri-water for against the same coming up for a final peri-Now the estimation of the course upon which a ship copic slight or series of authe before launching the torpedo within a distance of a thousand yards, is despedo within a distance of a thousand yards, is despend on the control of the con

meshanism for steering curved courses, which has been tried out with very anountaging results. The types of courses adopted are designed to permat to the greatest speed and distance of travel for the ship with the largest immunity from torpedo or gunfire his, and it consists of a succession of simple or compound graduated spiral area, so arranged that the curves mal-isto one another Sude spirals are selected as are of sufficient curvature to confuse observation by the U-book, or by the gunnery officer of a warning rofer, and yet will be such as will not too much retard a vessel or cause hat to less teen much difference a connected with yet will be such as will not too much retard a vesses or cause her to lose too much distance as compared with a straight course. The embarrasament of a submarus captain in attempting to determine the source, speed and range of a vessel that is steaming on a curre will be widnot. The problem is difficult snough when the vessel is steaming on a straight course, and from a distant



"8" course and

Fig. 5. These diagrams show the effect of change of position of a movable

omerine the angle of departure of a curved course is assistally impossible of determination guarda a long double of experiments in curved-course saming, it was found that the retardation on the red course with the saw angle of helm used at all see at less than the whole retardation for a vessel making it, a finance course in which the shapes of ming on a signag course in which the changes of we are through a large arc

matic Course Indi

The automatic course indicator was prepared with the following ends in

- 1 To enable a ship to steer rigrags, scentific "8" courses apiral curves or combinations of them, with pre-
- 2. To impose upon the heli in such navigation no duty in addition to the one to which time and experi case have accustomed him-namely that of watching the compass and maintaining in alimement on it the normal compans-mark with a lubber
- To supply the navigation officer 3 To supply the navigation union and helimenta at all times with definite information, in intervals of time and units of distance, relative to the position of the vessel on the signag, "8" course, or curve, and relative to the normal straight course.
- 4. To provide an instrument suited to any vessel, whatever her speed, and whatever her variations in speed, her size and other characteristics, and

but were positioned on the fixed comp run, may fifteen degrees to the right or starboard of the longitudinal axis of the ship then the vessel would not be steering north, but 15 degrees to the west of north

Conversely if the lubber line were moved to the left or port and the vessel were turned accordingly the ship would be found to be heading east of that compass direction, the same number of degrees as the line was moved to the left of the longitudinal axis line of the shin

The principle of the course in licator is as follows lubber line is marked on a 111, which is retatable A lobb about the compass car! If the in is moved to the

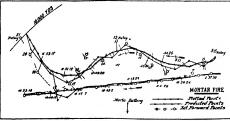


Fig 7 This shows the difficulty of hitting a ship that is sailing on a curved or S course

It slips above the course as resimmated by effectivent, it is land fort and the point of fall of shells (see detected line and circles) freed at sife skip. It shows the difficulty of predicting the point at which is ship will be when the shell stitute. This difficulty is due mainty to she first that the gunner set makes of the fatture printingers this shelp are based upon the creations assumption that she is sailing and the fatture of the fatture printings are shell of the course of the fatture printings are shell of the shelp are based upon the creations assumption that she is sailing and the fatture printings are shell of the shell

her size and other characteristics, and designate to any type of compass, magnetic or gyrescopic, i. left or right of the axis of the ship then by cassing the characteristics are now averaged by using the hoins or that "selected compass mark to follow it the ship will go to what is incover as a "hibber-line" on the fixed compass are characteristics are as the second of the compass and two particles, which line is set in line with the vessel a longitudinal looks at a given course mark in the compass and keeps are considered to go seat the beliancement turns the ship until the compass are considered to go seat the beliancement turns the ship until the compass are considered to go seat the beliancement turns the ship until the compass are compassed in the compass and compassed in the compassion of the compassion o means of a grooved cam as shown in our illustration Fig 6 The cam which is contained within the bin Fig 5 The cam which is contained within the our nacle is rotated by means if a small electric motor it is evident that by outting the cam to correspond with the curve or 8" course which the ship is to

follow the ship will automatically because of the movements transmitted to the lubber line from the cam steer the learn I course. A ship will carry several A ship will carry several of these cams for as many different courses as may l desired

The value of the curve i or true as a protection against gunfire whether from an entry ship or a shore on placement will be exist at nec placement will be exifint at nee and Mr Butes has jubi hed a le scription f the emplyment of the curse in heat r during a special maneurer of a ship and b free certain coast fertification with the

permission f the military authorities The description of this interesting Murtars are the main coast de

fense reliance It is publicly known that they are generally fire i in view of three observations taken at 0 econds 30 seconds and 1 minute The angles and ranges noted on these to locate the so called prediction point at the 2d minute and the sit forward point which adds the time of flight of the projectile and is the point at which the shell is simed to fall. In the case of mortar fire with its high trajectory this is between 45 seconds and one minute for most ranges. It is the precise to calculate therefore for mortar fire the future posi-tion of a vessel from one and three

guarters to two minutes ahead. On a straight course the prediction and set forward points come close to the vessels actual course. Figure 7 ahows this fact for ranges between 8 000 and 9 000 yands Inspection of the results shows an average error of 35 yards. In regard to sinuous courses at the same range one finds for a cam course called S I an average range error in the set forward point of about 90 yards in range and 15 yards in deflection. On inspecting Cam 3 course one finds the errors are very great in the determination of the set forward point (am 3 course run at 8 000 yards range shows average errors in the location of the set forward point of 175

(Continued on page 82)

The Final Solution of the Airship Problem

Industrial Production of Helium and What It Means in the Future of the Airship

By Ladislas D'Orcy, MSAE.

THERE is a widely spread belief that the war, or rather the sarphano, has killed the airship for the control of the control of

predereken of belium in large qualities and as a compactively low one large, son-inflammable gas, the second lightest income (the lightness being hydrogan), is relatively abundant in all minerals which contain radium, therein, ex unahms, such as theriantle, circuits, etc., but the qualitation of supershing hallom from these embassis has layered such as pract expanse—from \$1,000 to \$65,000 per code feet—bask its use as a hydrogen estimates was more estimated to make the contained of the layer of the feet of the production of the compact of the confidence of the compact of the confidence of the compact of the layer of the confidence of the compact of the layer of the confidence of the compact of the layer of the confidence of the compact of the layer of the confidence of the layer of the confidence of the compact of the layer of the confidence of the compact of the layer of the confidence of the compact of the layer of the confidence of the compact of the layer of the confidence of the compact of the layer of the

then found that the natural gases of Kansas Oklahoma then found that the natural gases of Kanasa Okianoma and Texas contain among other miponents about 1 per cent helium. This discovery was not followed up however. There was no dumand that would have warranted the development of the necessary apparatus. for drawing off helium for the very good reason that this gas could have been used in large quantities only for filling airships—and there did not exist at the time a

filling sambips—and there did not cast at the time a saged Americas as subject to the control of the America However, when the United States declared war on Germany the Butsh Air Board railed the attention of the American government to the fact that one of the important contributions thus on thry could make toward winning the war would be the industrial production of bettime. The problem was provided that the production of bettime, the problem was provided and a swell of which an experimental plant was constructed on engine lines while such of two pomeances cargast at the producwhich an experimental plant was constructed on original lines while such of two companies engage in the preduction of liquid air was induced to build a plant to a combined of the companies of t lines while each of two companies engaged in the produc-

Services should have attached so much importance to the quantity production of helium

On the Drawbacks of Hydrogen

The principal though by no means sole drawback of The principal though by no means sole grawbases or hydrogen is as has been said befor the extraordinary inflammability of this gas. The existence, underneath bundreds of thousands of cubic feet of hydrogen, of internal combustion engines occasionally emitting flaming exhaust gases not to speak of the presence of gasoline tanks has ever been a source of worry to airship pilotswhile it seemed a poor inducement to prospective aerial travelers not with standing the comparatively safe record of the Zeppelin excursion line Considerable progress or the Reppens excursion me. Considerable progress has been made it is true in enclosing the engines and screening off the exhaust collectors, but the risk was still latent because even the best balloon fabries are not wholly as tight and a small quantity of leaking hydrogen

wholly gas ugit and a smarl quantity or reasing nyuvogen would under certain conditions suffice to cause disaster A further element of danger was introduced in that rubbarused fabric becomes self-electrified in dry air and rubbrised fabric becomes self-electrified in dry air and centile sparks when creased in any way—for instance, owing to a loss of tautiness of the gas bags. The attendant rask was overcome by the Germans with the de-velopment of a cotton fabric lined with goldbrakers skin, which apparatily cannot become self-electrified of Amother serious drawback of hydrogen is its ability to form as anylower mixture when sailed with a certain of the control of the con

non-rigid airships because, owing to the single envelope, the studies gases are instantly carried away by the air steam which surrounds the vessel in flight. But on rigid airships where the gas begap proper are surrounded by an outer cover, the ring space thus formed contains more or less stagnant as which garned the surrounded with the hydrogen leaking from the gas the rigid airships another source of danger though it is somewhat beasened another source of danger though it is somewhat beasened

Battleplane Armament

From the Automatic Pistol of the Early Airman to the Multi-Gun Fighting Airplane of Today



 $A^{1} \ LHOUGH \ highly minginarity, writers had predicted buttles in the in-1 tween rivial fleets of airplanes the great nations cut i d the 1 urops an war with little thought of arming their machines. They did not expect$ the gran nations on 1 of the luropean war with thought of arming their machines. They did not ex-battles between airmen fr as they thought there plenty of other work fr armen to perform. So pienty of other wire it arming is perform to with marked military conservations the great powers did not arm their planes and the only weapons the armen had were their automate patche and in reduted instances, infantry or cavalty rifles which were the used in the event of a first chanding behind the en my lines.

the arphane was is kef ipon as a super scout or a sort if wing d cavairy a t ap ak. It was considered quite passible that airplanes might a ive for hombing purposes but the poor results obtain d with the st arrows crude bombs and bembing equipment of the early days served momentantly to convince the military men that the first duty of the airman was that of super scout Meanwhile the Germans had gone deeply into

sout Meanwhit the Germans had gone the matter of military avaision and whin the war opened they were ready to employ their armen in the regulation of artillery fire. Indeed the excilient marketmanship of the long range German artillery at the beginning of the war was admitted to be marvelous by the Ulird armes until they tree learned the art of a risk meeting. too learned the art of acrial spotting

It did not take the French pilots long to get on to acrial scouting and spotting despite the numerous handicaps outrini-ing them. By October 1st 1914 the French airmen were prying into the affairs of the German commanders in the most his high perch the military airman could sketch and jot down notes of enemy dis positions and activities and then fiv back with that invaluable information to he headquarters | this had changed all war

Note the Germans and the Literate armine soon some to the full realisation of the armal scouting activities. Lach ade decided to push its nersal scouting activities to the utmost while hampening the curvey as after as possible. Thus the offeneive and lefement active were intruduced in aerial activities an I soon the planes took machine guina aboard and world furth to be the

the light hearted way in which rival airmen proof the open nearror way in which rives airrine pseed each other in the skew during the opening days of the war merely waving their hands or shaking their fasts at one another they went to a rial billing frest spirit bent on destroying the enemy whenever possible. As early as August 15th 1014 a Pull Schmitt highlane of the Freuch which had been short down by the German antiarread gunners was found to be equipped with a machine gun and 200 cartridges. By November practically all the Voisin hiplanes of the French were armed with machine guns. Records show that the first airplane downed in aerial combat was shot down on October 5th, 19th 19 begeans Frants of the Freend army, in company with his mechanic, Quenauti both of the Fracardille 7-26, composed entirely of Farman pusher biphanes Frants and Quenauti engaged an Arustit beplane at a height of 5,000 feet, and after a few shots the German machine crashed to earth me inttle wood behind to French lane. The pitch had been killed outright by a bullet, while the passenger, a Prussian nobleman died before he could be pulled out from under the wreckage which had burst into flames. During the serial fighting of 1914 not a single French pilot was shot down in serial combat such losses as were incurred being due to fire from the ground which was then particularly efficacious because of the low situade at which the machines were

December 1914, saw the 'fifth arm of the French army formally consecrated to its due share of the great

Morane-Sauinier "parasol" scouts employed in the early days of the war

The airplanes were divided into escadrilles for war. The airplanes were divided into seesdrilles for stategor renonnassances and for change cenery ma-criategor renonnassances and for change cenery ma-criated and statement of the photography. Observation and artilles are considered and the bom-budient excadrilles for the bombing of enemy works the regular routine of military avaistion, and the bom-budient excadrilles for the bombing of enemy works. The Gtranas followed suit as did the Britah whose serial facet was fast developing into a gant organisation from an allowed insignificant showing at the outset of the

From an amous magnificant showing at the outsets the war. The first Fronch change establies were created at the end of 1915. There were few of these fighting units in extence when the Lafayette Lescadrille was formed. April 17th 1916. The change seasofulles. formed April 17th 19th The chaung escadrilles, operating freely in magned sones wer intended to bar the skies for them machines and to provide protection for the army corps machines engaged in routine work Up till 1910, the army corps escadrille was considered

the fundamental base of the aviation system, but the battle of Verdun and the growing aggressiveness of roving

bands of German serial warriors, which came to be known as 'tango circuses and traveling circuses" in some instances proved the system to be utterly wrong when instances proved the system to be utterly wrong when dealing with an enemy having the initiative of attack Accordingly, the chaning ceasifules were grouped under a single command and the immediate protection of the army corps machines was left to the latter, which soon had to assume a more or less defensive stitution in carry-ing on their work. Nevertheless, it was the formation of the separate chaning seasofulles which permitted the Entents armies to most the serial offensives of the travel-ing German exactability, thus restance areals behaves of ing German escadrilles, thus restoring serial balan power whenever necessary guining supremacy of the air at a given point during an Entente offensive, and raising the morale of all Allied airmen all along the line

The single-seater fighter or chaser or scout, as it is

The angle-scater fighter or chaser or scout, as it is variously termed, was born of the demand for a fast and resulty manusured machine. It brought about the great competition between the Germans and the Allies of producing faster and better fighting planes for the scouts, like the battleships of the navy, are the real bases of areal fighting planes power. Ah art fifted may of aerial fighting power. An air fleet may be made up of large numbers of reconnaissance and photography planes, bomb-ing planes and other machines for the

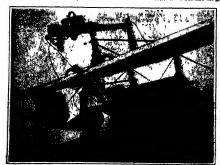
ing planes and other machines for the routine work of search warfare, but when it comes to batting the single-seaters de-termine the issue.

In the beginning the single-seaters were generally monoplanes, and the aircraft constructors made use of the knowledge gaused in developing high speed types for the great races before the war. In fact, the great raous before the war In fact, sobut of the single scate or monocoque Deportunan racers were amployed by the Prench at first, for the roason that they quite outraced sayling the Germans had secure that the secure had to be a good fighter, so the monoplane design was more or less abandoned in favor of fast bulanes which could carry the necessary arms most

How to mount the machine gun so that it could be brought to bear on the enemy was one of the great prob-lems. In the first monoplanes attempts were made to in the first monophanes are mips were finder to mount the machine gun high above the arrman so that its line of fire would be above the aweep of the propeller blades. However such construction was exceedingly awkward for the aerial fighters if not decodedly dangerous awkward for the serial figures: I not decodedly dangerous since the airban had to stand in order to operate the gun, and standing in a machine making better than 90 or 100 miles an hour is not the most pleasant of sansations. The accuracy of one s fire in such a position can well be

imagined

Now the two-centers of those days were also con
fronted with the machine-gun problem. In the "pushir
type, where the propeller is behind the wings the machine
gun merely had to be mounted in front of the observer.



Heavy armament of a Niceport scout. A Lewis gan above and a Vickers machine gun on the cagine cowl



Wresk of a French Pleasers secul, showing the Wolson sincking gan

Such a machine, however, could only bring its machine gun to bear when acting as the pursues: If an eacony machine happened behind it, there was no way or shooting rearward. In the case of the "tractor" rearward In the case of the "tractor" type, where the air-serve, to give it the proper name, is in front of the wings, the machine giu was mounted buhind the pitot and the observer, so as to aboot at any angle bask of the machine But if such a machine happened to be chasing another machine—well, it simply condit at act as a pursuer for the reason that it couldn t attack is the makes and the tractor types were

chms—well, it simply coutant acc as a pursue for the reason that it couldn't attack to the pusher and the tractor types were actomatically obliged to set on the offenance actomatically obliged to set on the offenance obvious, was an awterned state of affairs. The problem of mounting the machine gun in front, even in the tractor design which had come into favor because of (certain tructural and aerodynamical advantages which could not be ascended even for the which could not be ascended even for the machine-gun, which as chip-do, on the engine, cowl directly in front of the pilot. The gun was rigidly mounted, and the pilot, whether in a single- or two-essets ranchins, brought to bear, on the Larget by aming the entire

in a single- or two-easter machine, brought to bear on the target by amming the entire machine. Thus the pilot's hands were left more yo less from the to manage the arrylan, as in more procedul times. The line of fire necessarily passing through the weep to the air server in front, the French placed small pinces of steel or "deflector plates" on the parts of the screw believe to the screw that the parts of the screw believe to the screw the steel of the screw that the parts of the screw the steel of the screw that the screw t bullets as struck the propeller were deflected by the steel binists as struck the proposes were desected by the steel blades without causing damage. Such an arrangement, to be sure, entasted some loss of ammunition, since the deflected shorts were wasted. But the greatest handcosp was in the loss of speed, which is east to have averaged to miles as hour, due to the retardation of the air series.

to miles an hour, due to the retardation of the an earew, and in the graeling competition between rval armen that loss was fat too serious to be permitted to stand. For a time the French mounted a quick-firing cannon on their Vosan "pushers" with the object of more meadly destroying some gant planes which the Germans were employing early in 1915. But the difficulties of earlial markinanship alone compet the use of a machine gut with tracer builets, because of the greater number of chances of hitting the ensemy Again, machine-gut fire is quite sufficient to account for the crew of an arrival control of the control plane, and, with the use of meendary builets, the machine itself. So the accommon, as the French called that

tasell So the coron-conon, as the French called that type, was some abandoned. By now the Germans had come along with an in-genious synchroniaing mechanism, whereby the machine gun, mounted on the engine cowl, could fire through the tractor air-screw sweep between times, so to speak That is to say, by mounting a cam on the engine shaft, riskt is to say, by monating a tan of the ongine shart, and running a transmission system of levers and bell cranks from this tam the gun mechanism was only operative at such times as the line of fire was clear of the air-screw sweep. The Yokker machine which the Germans employed in 1915 and which proved the terror of the Allied airmen because of the heavy toll which its pliots collected, was equipped in this manner. The German pilot merely maneuvered his Fokker until the sights bore on the target, and then pressed a trigger



Typical German chaser—an Albatross in this case—equipped with twin machine guns on the engine cowl

release, whereupon the gun automatically fired between the passing blades. Early in 1916 the Allies were ready to combat the Fokker with the Nauport biplane in which the machine-gun was mounted on the upper plane clear of the air-screw aweep, and operated by a flowden were control on the "joy stake." Thare were xeveral variations of the Nieuport armament, but the standard one was a single Lewis gun with a sangle pan of amountation containing 49 rounds. After discharging the pain or drum, the airman had to come down for another. While the gun performed splendtdly and could be accurately aimed by the sightle on the engine coul in front of the airman that performed speedurally and could be accurately aimed by the sights on the engine cowl in front of the airman the limited supply of ammunition was a serious objection Scop pilots began mounting an extra machine-gun, usually of the Vickers belt-fid type on the engine cowl, using a synchronizing device to take care of the airscrew sweep Other airman preferred two Lewis guns mounted side by side on the upper plane with individual Bowden wire controls Thus if one gun jammed ran short of ammunition, or i crame otherwise inopirative, its mate could be brought into play bill other airmen arranged the Lewis gun on a trunnon so that it could arranged the Lewis gun on a trunnon so that it could be tilted with the butt end in the arrangement was found excellent while attacking a machine from below. In it is, it the same arrangement is still in use on the recent littich %1.5 scouts. The synchronized machine gun arrangement having proved its worth, it soon liveame the standard of all air fleets. All Albed and Graman these is not week.

seaters of the tractor type were an I we still thus armed From a single machine-gua in my airmen have gone to m a single machine-gua in invairmen have gone to mounted side by side on the chance cowl and so alined as to have their fires or set a point a hundred yards or so in front Guns mounted in that fashion can be used angly or in pairs by incurs if trigger controls on the poy stock, and the airman is not so hable to be

caught with an inoperative g in

As for the sights employed on souts and reconnais sance planes of the tractor design these vary from simple open sights to elaborate telescopic sights. The open sights generally take the form of a simple ring with cross wires for the rear sight and a standard topped with a small ball for the fore sight. The telescope sight is equipped with cross hairs. A chin rest r a forehead test is oft in provided so that the airman can steady his head while taking aim

Meanwhile the armament of the two-seater machines of both Germans and Allies closely followed that of the scouts so far as practicable The prevalence of the tractor type gave rise to the rigidly mounted syn chronized gun or guns in front, operated by the pilot and single or twin guns for the observer in the rear cockpit. At first a the pilot and single or twin guns for the observer in the rear cockpit At first a simple goose-neck mounting was employed for the rear gun but the Germans intro-duced a most ingonieus mounting in the form of a revolving ring an adjustable yoke, and of a revolving ring an adjustable yoke, and a stool turning in conjunction with such a gun rest. Thus as the observer swings about to any point of the horizon, the gun turns with him and always remains in front. A locking device permits of first looking the revolving ring in place their locking the yoke rest when the proper elevation has been

obtained and then the gun I his arrangement, variously known as the "tourelle' "ring mount' and the scari yoke" has become standard for all air fleets

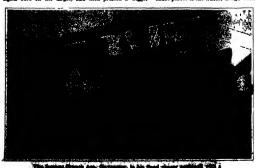
Up till the signing of the armistice the armament of all planes had been pretty well standardized. In the case of twin-engined planes, where the air-screws, being on either side of the body, are not in the line of head-on fire the usual arrangement calls for a tourielle for the front cockpit and another for the rear cockpit. In some in-stances, twin guns are mounted to preclude gun trouble er ra connaissance or general utility planes, such as our DeHaviland I ours, being equipped with a tractor sorew, have a standard armament consisting of rigidly sorrey, nave a standard armament consuting of rapidly mounted gun or guns on the engine cowl, and a tourelle for the rear cockpit. Scouts are unvariably equipped with one or two guns, sither rigidly mounted on the eagine cowl or on the top plane bor the ragidly-mounted guns the air-cooled, beliefed Maxims us standard with all guns the air-cooled. air fleets

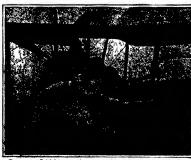
For the tourelle mounting the Lewis gun, stripped of its large cooling tube, has been used by the Allies because of its pans or drums which can be readily handled. The Germans on the other hand, have made use of a modified Maxim with a very light, perforated cooling tube and a reel mechanism for handling the ammunition belt This gun is known as the Parabellum.

This gun is known as the Parabellum. (
In naval aircraft the armament has followed military practice wherever it saitle Such anaplanes as have been actively engaged against U-boats have in many instances been equipped with the Davis non-recoil gun, fring s 13-2 or 3-incl shell 1 he mining of such a gun has both of the simplest, consisting of a saviet and trunnion.

In the majority of scaplanes, however, machine gun have been used. The armament of the large flying beats employed against the U boats by the British and American naval forces, has generally been a tourelle for the front cockpit, another for the rear cockpit, and often two guns firing through port holes in the sides of the huge, boat-like hull

(Continued on page 85)





The Principles of Camouflage-I

The Art of Concealment and Deception as Practiced on Land By M. Luckfiesh



A huge Zeppelin shed with roof extending to the ground, eliminating abadew-casting

when pating our wite against that of a crafty prey or a my. It is an art much lier than the human race ir its beginnings may be traced back to the obscurity of the early age of the coolu-tion of animal life. The name was comed by the I reach to apply to a definite art which developed during the Great War to a high state. as many other arts developed by drawing deeply upon the resources of scientific knowl-With the introduction of this specific word to cover a vast field of activity in scientifically concealing and deceiving, many are led to believe that this is a new art But such is not the case, however like many other arts such as that

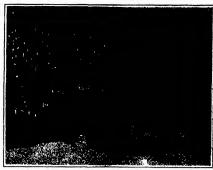
CAMOULLAGE is in art which is the natural argrowth of our instinct for one alment and deception

of flying the exigencies of modern warfare have provided an impetus which has resulted in a highly developed art

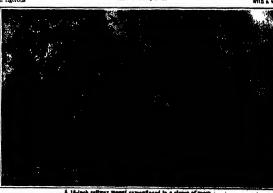
Scientists have recognized for many years, and perhaps more or less vaguely for centuries, that Nature exhibited wonderful examples of concealment and de-Darwin expressed his doctrine, included those individuals of a species who were best itted by their markings and perhaps by peculiar habits to survive in the environ ment in which they lived Naturally markings, habits and environment became more and more adapted to each other until have an increase became in equilibrium with Nature sufficiently to insure its perpetury if we look shout us upon animal life we see on every hand examples of concealing coloration and attituted seigned to deconve the prey or enemy 1 he rabbit is inottled the prey or enemy The rabbit is mottled because Nature a infinite variety of high-lights, shadows, and hues demands variety in the markings of an animal if the latter is to be securely hidden Solid color does not exist in Nature landscapes in large areas The rabbit is lighter underneath to compensate for the lower intensity of illumination received on these portions

As winter approaches, animals in rigorous climates need a warmer coat and the hairs grow longer In many cases the color of the hairs change to gray or white providing a better coating for the winter environment

Animals are known to mimic inanimate objects for the sake of safety For example the bittern will stand rigid with its bill pointed skyward for many minutes if it suspects an enemy Non-poisenous anakes resemble poisonous ones in general characteristics and get along in the world on the reputation of their narmini rela-tives. The drone bee has no sting, but to the casual observer it is a bee and bees generally sting. Some ani-mais have very contrasting patterns which are conspicupatterns which are conspicu-ous in shape yet these very features disguise the fact that they are animals Close ob-servation of fishes in their natural environment pro striking examples cealing coloration.



A road screen in Italy to prevent detection of traffic which could be viewed from the enemy lines.



A 16-inch ratiway mount camouflaged in a close of trees

the subject by seemats so it will be only touched upon here Mr G H. Thayer's "Concealing Coloration" is a very readable volume for

of "mobile" camouflage to be sonal changes have been cited in a foregoing paragraph. The changes its color moment to moment to moment for from moder changes its color and patiers to suit its environment. It will even strive to imitate a black and whate ment It will even strive to imitate a black and white checkerboard

In looking at a bird, animal, insect, or other living thing it is necessary to place it in its natural environment at least in the imagination

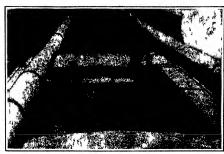
it in its natural environment at least in the imagination before analyzing its coloration For example, a male mailiard duck hanging in the market is a very gausty obsert, but place it in the ponds and the present primary in consequence in the second partially and the shadows and it is substituted in the property of heralding its presence anywhere in the case appears to be marked for the purpose of heralding its presence anywhere in the range of vision, but in its reedy, bushy, gramy on vironment it is sufficiently incomplications for the species to survive in Theoretical Control of the species of the survive in Theoretical Control of the State of

spots simulate shadows or voids, the compensation for lower librariation by countershading, and many other facts. The artist has added in the development of canonings but the definite and working beats of all branches of canonings are the laws and facts of light, color and vision as the scientist knows them has unconstituted to the scientist knows them has unconstituted to the scientist knows them has unconsulty survived out the scientist color to the consulty survived and the scientist color for the scie

natural instinct The Indian painted his face and body in of the adva







When the U-beat was within point blank range the hatches were thrown open disclosing gun and crew

Decoy Ships for Submarines

Some Details of Naval Actions Which Brought the Victoria Cross

"ALL the world loves —a sailor when he is of the
A heroic type of the men in our own and the Allied
services, who when duty called have not stayed to count services, who when duty salled have not stayed to count the ceek From tame to time our Navy Department has tood the story of valorous descrit done by our officers and sone upon the hulls sone, and here and there, men on returning whips add to the brilliant record All the Allind navies have contributed their quots of recorded beroisen to brighten the tragic blacking of this great war on

Recently the British Ad-missity have made known why the Victoria Cross was awarded to certain naval awarded to certain naval-officers and men during the war It seems that the cov-tend decoration was won upon certain ahips, whose estistance and operations were kept a profound secret dur-ing the war Those war-ting the war Those the terp' type, which carried a camouflaged anti-submanne of history and the common of the com-tended of the common of the common of the com-tended of the common of the common of the com-tended of the common of the common of the com-tended of the common of the common of the com-tended of the common of the common of the common of the com-tended of the common of the common of the common of the com-tended of the common of the common of the common of the com-tended of the common of battery and were manned by carefully selected volunteer crews Outwardly, they bear

cover Outwardly, they hear the spearance of small tramp stances or small tramp stances or small tramp stances or smalling confl. of the kind that engaged is the constal tread around the Britah Islas and the standard with tread around the Britah Islas and the standard with the stand

enabled them in a few sec is to be iropped or folded back, exposing the conceal d gun and gun crew with their weapons trained directly upon the U boat

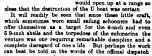
To enable the commander to k p an cyc on the U

To enable the commander to k p an cyc on the U book, a perisope disguised as h hin ney of a stove was emplaced in a position wher it con manded an all round view The conning tower had the appearance of a large coil of rope, while another; le of heavy rope served to

made for some waters where submarines had recently been reported or where they wer went to foregather, and steamed or sailed along as though she were on a peaceful merchant voyage When the submarine was sighted she made every apparent effort to get away though as a matter of fact the vessel would be slowed up gradually so as to bring the submarine within range as soon as possible In some cases she would carry an

after gun either real or dummy such as was mounted on merchant ships and would even engage in an exchange of shots. The crew of the ship was divided between the actual fighting crew who remained carefully concealed, remained carefully concealed, and what was called the panio party who when the vesual was heavily abelied or had been struck by a torpedo would make a rush for the loats and pull away from the ship When the submarine had come up within point-blank range the false hatches tarpaulins and other cannotines.

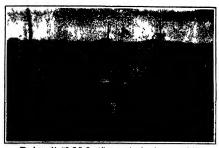
revealing the guas, due to camoufage would be flung open and the guas would open up at a range so close that the destruction of the U boat was certain





A typical divey ship, with forward and midship falso dockhouses thrown open revealing the guas, and the after deckhouse closed





The decay ship "fluffelk Coast," apparently a harmless tramp of the kind beleved by the U-beat commander

World Markets for American Manufactures

Edited by LYNN W MEEKINS

A department devoted to the extension of American trade in foreign lands

Our Opportunity in Brazil

DFTILR delivery serves, in at present the greatest need of North American spiritis whiley their goods in Brani and the ripres intaits of a commission home which has branches in South America. We have hundreds of or lors or our books and the consignments are awaiting shipment but there are not enough vessels to take them. At loast 70 000 tons of censuit are ready tog forward as are thousen is of I illum worth of agricultural implements also unstung machinary and show more than the standy imputed in the processing the state of the standard processing the

Broat is one of the largest and rechest countries in the worl and apportunities to develop its resources are unlimited. The Branilans are more friendly to us than see any other people of I still at America. A market in which (armany was strongly intronched before the war, Brasil offer many chance to day to American manufacturers. The typowriter is one American product that is making considerable headway just now 'since last summer the Brazilian Government has permitted contracts with its various departments to be presented in typewritten form. In the past documents of all kinds have been written by hand but this practice is being abandoned since the advent of American salesmen who have introduced standard typewritting medianes and have organized schools where stenography and typewriting are taught.

American Dental Equipment in Wide Use

For some years the United States has empyed a very satisfactory part of the Brazilian trade in dental instruments and supplies. Nearly all of the 1500 elentates in Brazil are natives of that country largely because of the raid examination gives in the Portuguese languag that must be passed blorder dentatry may be practised. Dental purlows in Rio de Jamoro are like tinese in the United States as most of the equipment is of Anurecan manu active and a man who has live in that facture and a man who has live in that facture of distall chairs increased their prices German made chairs of inferior quality solid at a nutch lower figure were cutting into our shane, of the trade just before the war. Customs lutters we light and Brazilian importers are better able to

before the war where same better able to dispose of the less expensive chairs. In great cuttral part of Brazil is the least known of any section of the world Although literally darker than Africa is not lacking in molern requirements for one thing sawage disposal systems are

needed which means an excilint opportunity for the development of trial in pipes and machinery for such plants. The agents of American frine who have vasited Brazil have 1,cit too print to confine their attention to the large coast critics and have neglected the interior of the country with reference and the reasons of live stock tries the Government has removed the import duties on farm implicitly and and on proceeding the stock of farm implicit and and on pure 3-red cattle and horses

Brazilian Cities Are Well Lighted

As an industion of the extent of the market for elerated supplies, in the state of Wo Paula olane 180 crises recommended with electric lighting facilities. It is experted that American electrical irons to materia and other devices could find an increased sale in Rio Grande of Sul through intelligent sales methods which would include correspondence with dealers conducted in Portujuece, the sending of attractive literature accompanied by a statement of terms prices and discounts and the supplying of data showing the volume and weight of goods packed for export. In this section of Brail, German houses have been successful un controlling most of the importation and distribution of foreign goods But this has not prevented the sale of American electrical

of the importation and distribution of foreign goods. But this has not prevented the sale of American electrical supplies, which have proved their superiority. Brazil is a good market for American drug products and pharmaceutical supplies. It is said to use more permitted in the same of the sa

proprietary medicines are popular in Brazil, where the people are noticeably inclined to use such remedies for their allments. In the city of Rio do Janeiro there are more than four hundred retail drug stors and every village has at least one such establishment. Mediced milk and grape junes are typical American articles that have been sold successfully in the larger cites of Brazil The best way to place American products of this sort on the market is to send travelling aslament on introduce the goods and appoint competent representatives Some American manufacturers have established branch fastocles

Market for Paper and Other Products

Hraul as the second largest consumer of paper and paper products in South America importing more than \$14,000,000 worth in 1916, but the outlook for an increased trade in this line is not by meniang because of the country s slow educational development. About three-fourths of the population can neither reas nor write like expansion by the Braxiban Covernment of the public school system would result in a larger domain for paper and for many other commodities. In two of the three great manufacturing ottes of Sunth America—Rio de great manufacturing total soft sold field for the sale of undustrial machinery, sepacially that of an intrease nature.

Our manufacturers need more direct representation in the important trade centers of Brazil" declared an American trade commissioner just returned from South America We need also a fast and regular frught



A display of American dental goods in Rio de Janeiro

service to all the primopal ports. Without it we are as errippid as a department store that depends upon causal message, buy to make its deliveries. To obtain more Brazilian business we must extend more satisfactory credits Brazil has every natural resource that the Inited States has and others in addition. The investment of the states has and others in addition. The meret create the largest single incentive to our trade with Brazil. We must pay more attention to advertising Publicity methods in Bouth America may be compared to those prevailing in the United States thirty years ago the application of American diseas would make Brazilian advertising more effective and result in making thousands of our products as well known as the comparatively few American goods already standard with Brazilians. If they knew us better, the people of Brazil would buy more from us, but they have hardly any consciption of our national Mes. At the present time they are interveted in as and have met us half way by ladicating their friendship."

The Renaissance of Commerce

THE business of war, prish has dominated the world for the last four yeste, is now giving way to the business of pases, which will be by no mans a passeful business. The war should the flust off the world's trade and in its newness sell brightness it is a wonderful and a dangerous thing—worskerful in its possibilities for the manufactures and exporters with knowledge and vision, and dangerous for these, without such qualities.

In foreign trade nothing should be taken for greated Its changes are kalesidoscopie, its conditions ever varying, and he who would not keep up with the dissess had better stay out of it. There are very range manifections of our selling anything in Europe. They have read so much about the preparations for size the war that England, France, Germany and other nations have been making that they have deceded to draw into thus shells so far as selling American goods in that part of the world is concerned. They still think that the American manufacturer who pays his workmen with collars is unable to compete with the European mannfacturer who pays for his labor with france, leaving out of connected that the United States has the world of the state of the st

many cases

Very soon we shall have to increase our sales abroad

or else face an indefinite period of hard times. Face

tores cannot be kept going unless the orders on hand

are sufficient. The failure of a number of our manufacturers to realize the importance of foreign trade

has thoroughly discouraged quite a few trained foreign

representatives from handing American goods A man

of long commercial caperience, born in Greece, whas spent more than ton years in the United States,

complained bitterly the other day about the lack of

interest in export bunness that he found in Americas

industrial circles. He got in touch with a handred su
tores, offering to open a well-equipped

tories, offering to open a well-equipped building in Ahens where their products could be displayed and saking them to let him have samples of their goods, for which he agreed to pay, and descriptive actaliques. Although the man know the Near East from A to Z and has ample capital to finance the understaing, he received only two replace, but one of which the control of the

vas inversible

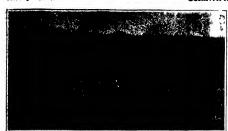
'I can' understand why American exporters are not aware of their opportunities in the Levant,' he said 'The United States will have excellent shipping faculties when its new fiest is built, and it will be me easy matter to inaugurate a steam stall in the said of the trade of the Levant in the hand of the trade of the Levant in the hand of the trade of the Levant in the hand of the trade of the Levant in the hand of the trade of the Levant in the hand of the trade of the Levant in the hand of the trade of the Levant in the hand of the trade of the Levant in the hand of the trade of the Levant in the hand of the trade of the Levant in the hand of the trade of the Levant in the hand of the Levant in the Leva

there, which means that direct trade is the most way that American goods can complete with those from hurope. If the manufacturer will study the geography of America, be well find that Egypt centrains something more at \$1,500 an acce and a full measure of property dies at \$1,500 an acce and a full measure of property dies to the high quality cotton crop, Leypt is a spirited bidder in the foreign market. Its purchases from the United States have increased very considerably in late years, and it is a field to which more stention should be paid. Our trade with Egypt has been handlespeed in the past the property of the

by the inex of circuit seasmanp innes.

Our new forcing counterers will carry into all parts of
the world many lines of American goods which used to be
restricted to comparatively few markets. We are now
sending abroad numerous commodities that we did not
export at all before the war and some that we did not
previously manufacture. Uncle Bam's general store
has added tots of new department. He can sell to his
foreign customers a greater variety of lines than ever,
thanks to the vext industries merry devaluous.

has added lots of new departments. He can sell to his foreign entromers a greater variety of lines than ever, thanks to the wast industries newly developed. We have also progressed in the manufacture of changicula, and instead of something just as good as those we much better. With the direct sent immug out something much better. With the direct sent immug out something from we orders, their profitable operation department of the extent to which are foreign buleases replaces. She military demands of the period now endless. Convoluplanating, bessed upon accurate information, and a gession degree of friendliness toward prospective unstoness size essential in the new order of change.





A highway bridge in Wisconsin and its twin brother. The use of the existing plans for the second structure was made possible by building it on dry land and diverting the river to flow under it

Quantity Production in Bridges

A COUPLE of years ago re discussed briefly the Question of separatine crossings, and showed that, whether the crossing were at grade or above or below, operating safety required the road to run in a single straight line, to include both the crossing itself and a considerable distance on either side. We pointed out that when this requirement was not meet, the leasened first cost of constructing a perpendicular crossing, compared with a long diagonal ones, was properly to be regarded as a secondary matter, as against the cost of maintenance and the great dangers of the serpetities

recoming the many situation comes up frequently in building a bridge. The read approaches and leaves the river at a considerable analy, or at a point where the river bends in such a way set to give a long crossing. If the bridge is such a way set to give a long crossing. If the bridge is such a way set to give a long crossing. If the bridge is such a way set to give a long crossing. If the bridge is such a set of the read and the set of the read, one at seah of the bridge, in order that the latter may be of minimum length, we are but lending our troubles to the future.

The bridge ungineer has a way out of this dilemma way through which the constructor of a rail-highway crossing cannot follow him. The railroid is permanent feature and cannot be shifted; but it is a simple matter to prove the construction of the property of the property place. Bot this is what the bridge engineer closs, he smaply redocates the triver at the point where he can bridge it myet conveniently and erronnessily.

simply relocates use river as use point were us one in mait most conveniently and economically.

Indicatally he derives another advantage from this procedure. Instead of first moving the stream and then building the bridge, he builds the bridge and then diverte the stream to flow under it. Obviously it is not a very

the stream to now below the build a bridge of ordnary sase entirely on dry land—we could not go out of our way to do this But when it comes to a question of whether we shall build our bridge on dry land, or build a river first so that we may we shall estantly decide in favor of the former alternative, and make it good for such incidental advantages as it possesses it may, however, be supplained that its economists or purely indicated, the log saving, the bed difference between the cost of diverting the cost of diverting the cost of diverting the river and that of building an unnecessarily long bridge and that of building an unnecessarily long bridge.

pylyting the procedure or intuned, has recently despontuned, has recently despontuned and the procedure of the trained still another positivated with another positivated and the procedure of the Whose me shill a bridge at whatever point we happen to come upon 1 he maker, as whatever point we have proting to the procedure of the procedure of the proting to the procedure of the state of the proting to the procedure of the state of the proting to was done in one of the cases illustrated when we get around to the job of relocating the river we can make the width of the waterours. What we pieze—within limits, of ourse That being the case we can dig into our files for an axiating bridge plan and when we find one that we ike and that comes within the limits of the present case, we can accommodate the renovat I stream to it instead of going to the expanse of disagong a branch new bridge of the stream.

This is actually being down in Wisconsin. The two bringes which we plettur are located one in Artingo and the other near Manstown the natural spans, if the internant had in both cases here in it is undistricted would have been quite different in kingth and height of spans, since the profiles of the vallety were sholly different But in revising the river at Arting 18 was any to provide the transfer of the Arting 18 was any to provide the transfer of the Arting 18 was any to provide the Artin

An Over-night Concreting Job

THE accompanying illustration shows the laying of a concrete foor at night with rendrored 1 haum sections in a large department stor at Cleviand I he spans in the construence were 20 feet with a total load of 250 pounds per square 1-14. The criticis was accomplained without the use of forms or supports of any standard or the terminal of this manights who should not the broad of the standard or t

The upper layer of concrete is used as a finished coment floor, while the coiling plaster adheres perfectly to the lower surface without the use of any adhesive intermediary.

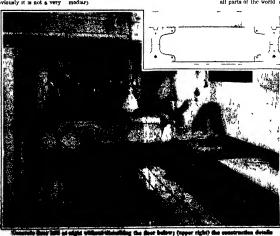
The Current Supplement

EVERY now and then the amouncement is made that meaning the service of the servic

graphs show the machinery and processes employed Taking Photographs from Auplence and Islanden describes and illustrates some of the special and unusual cameras developed for this unique kind of photography Other and the special and insurance as a Refraction of England Temporature of Gascous Mixtures, Antworbuste Principles of Limes and Lemons Fringing Refs of the Philippine Hands and The Interconnection of Economic Hands and Chemotal Indiana, and Chemotal Indiana.

New Glands of the Platypus

In the course of work on the nantomy of the platypus (ormithorhynchus paradotus), the Australian mammal which lays eggs and forms a link between the bleds and the mammal, proceed the course and the course of the plant of the course of the course of the plant of the course of the plant of the course of the plant of the plant



Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts 45 44 5

Surgical Machinery Up to Date

IT is almost a common place to remark that the war has reduced surgery t a precise mechanial art Negertheless as the various devices for emverting the hospitat into a machinesh p pass in review the living will hardly be able t r ta completely the garl of so phistication or t r strain altogeth a some expression of surprise

One of the latest exhibits of this sort of thing is the arm splint which we d the listrate hirewith It is obvious enough that this splint gives the

ary degree of rigidity but here it merely duplicates existing devices instead of surpassing them. Its adinstead of surpassing them. Its advantages consist in the fact that it can be used on either arm indifferently and can be adjusted to any desired position of the arm and of the wearer

The new splint has been ordered in quantities for use in our base hospitals ere and abroad and it is violating no dictate of military secrecy to state that the American Red Cross is responsible for its design and adoption. The advantages of having one spirit applicable to all cases of arm wounds are so obvious that we need not dilate upon them here It is just the same game of standardised trucks and standars id airplane engines all over again, on a smaller scale

Weighing the Temperature for **Blind Folk** By Jacques Boyer

THE victims of blindness whose number the war has unfortunately so in creased, excite more and more the instrives to ameliorate their lot by provid ing them with a variety of useful ap-pliances. In the course of the past few years various workers have adapted to the use of the blind certain machines tools and even games the Braille slate and the Braille typewriter furmsh in-stances selected at random Today comes a rendent of Nimes M Fleury Brunet with a curious thormometer that he has invented to make it possible for persons deprived of their sight to read the temperature quite as well as

anybody else
The device is a calorimetric balance

with which one actually weighs the temperature if we may be permitted this expression s a combination of a balance beam with a mercurial thermometer using the motion of the mer eury column to displace the center of gravity of the tube and permit the bind man to read, from its position, the degrees of tem perature marked on an index scale

The inventor has worked out his conception in a fashion at once elegant and sound The scale is



The standardized adjustable arm splint

bers along which it can be slid for a short distance backward and forward It is graduated in Braille characters, the lower temperatures being above and the upper once below The principal member is a rather heavy bar of aluminum, supported, on a knife-edge bearing, at a point near one end On its long arm it carries an ordinary mercurial ther-



How the new splint goes on the patient

for whatever temperature is to lie in the and die of the instrument's range—which ordinarily runs from sero to 40° Centigrade. The column of mercury then grade The column of mercury sun-plays the role of running we git, and by its varying position it controls the position of the balance—when the temperature rises and the mercury moves outward along the beam, the pointed



The thermometer that weighs the temperature so that the blind can read it

mometer rigidly mounted, and this arm terminates in a point. The short arm ends in a heavy ball and is provided in addition with two blocks which may be slid back and forth and locked in position This makes it possible so to minum beam takes a horizontal position

end of the latter falls, and in the opposite CAMO IT ITSOS

case it mes.

The point of the beam falls to touch
the scale in the normal position of the
latter When a blind man wants to
read the instrument, however, he pushes
the scale in toward the base, and as he
does so, the pointed beam passes through

one of the holes of the see and penstrates a little w on the other side. It is the looked in position, and it blind man can find it and pe the corresponding Braille character without any danger of displacing it and altering the accuracy of his reading. Having found the tempera-ture, the blind man moves the scale back to normal postion, and the pointer is again free to oscillate under the influence of temperature changes Inability to read the tem-

perature, while not the worst of the blind man's disabili-

ties, is far from being the least annoying, and this olever means of removing it will be appreciated.

A Stretcher That Gives Up Its Lead Painlessly

Paintensty

In the stroke made during the past decade by medical selence and surject gray, little sitemtion has been paid to one of the minor, but nose the less urgent, points in the heading of the injured—the means of gotting them off the stretcher and into the bed Every doctor will concede that the current style of heading not be painten in this transfer leads to irritation and shock which, in severe cases, may become a serous complication in this

and shock which, in severe cases, may become a serious complication. But there has been no suggested means for avoiding these unpleasant consequences. The stretcher above on this page duvides longuitudasly in the middle Each half of the caarvas may then be sloped from under the patient, after he has been deposited, in the stretcher, on his bod or oparting table, so the transfer takes place with no handling and no shock

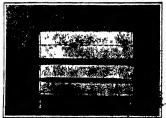
takes place with no nanoung ann no shock.

The center coupling of the new stretcher consusts of two fine steel rods, three feat to two fine steel rods, three feat steels and the stretcher through can var loop of the stretcher through can var loop of the stretcher through can var loop and are locked in place by a canvas strap that buttons over their outer ands in much fashions as abolitely to prevent their slipping out, while said rod checks the three fallings out, while said rod checks the fallings out, while said rod checks the fallings out, while said rod checks the fallings of the stretcher to six feet, making delivery possible to the standard hospital bad, sax feet two fashes in length.

The iron spreading rode have a slot at the center of one which slips over a rivest at the source of the opposits rod.

rivet at the center of the opposite rod and, when rigidity is in order, is locked

by a pin per both rods both rods. To pin in turn is he in place by a sm that steel apping.



The stretcher that divides down the middle to give up its





appright 1919 by The Goodyen; Tire & Builder Co.

"In this test of nineteen months we have demonstrated to our full satisfaction that your Goodyear S-V Solid Truck Thres give us a high general average mileage and a low general mile cost per tire, and their stamina has stood up where the strain is the hardest."—W. J. Sherwood, Gen'l Supt., Chicago Motor Bus Company.

As a result of the extensive test mentioned above, 90 per cent of the tires on the fifty double-decked busses operated by this company, are Goodyear Solid Tires.

This is because, although the balance is always made up of other tires for direct comparison, no reason has been found for changing.

The superiority of Goodyear Solid Tires

is most conspicuous at the points of hardest wear which are the front wheels of these busses. They are the driving as well as steering wheels. Their tires receive the worst struns imposed by the 10,000- to 16,000-pound burdens above them.

Out of 342 Goodyear Solid Tires checked, thirty-one ran between 15,000 and 23,000 miles, eleven went 20,000 to 25,000 miles, while four exceeded 25,000,

including one old warrior known to actually deliver 37,665 miles.

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Such economy could be produced by nothing less than the tremendous strength built into Goodyear Solid Tires, by reason of which they wear down very slowly and evenly.

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO



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strine Range-Finding by Means

(Continued from page 67)

which are above the audibility range of the human car kor one thing such high fre-quoncy s undwaves may be readily received For one thing such high freother sounds existing in water ich waves make it extremely difficult for a hostile ship particularly a submarine, to detect the sending source through the use of a similar installation When sound ves of a pitch above the audibility range waves of a pitch above the audithity range of the human car are employed the receiv-ing circuit incluies some form of inter-rupter or chopper which breaks up the high pitched sound so that it may be heard by the human car Whik primarily designed for anti-U-

bat operations the present device has a perman in uso. It literally enables the marriner to see under water Uncharterel ledges and pinnacles can be detected and wrocks can be located What is more Mr. Rues claims that with what is in its over the operator ought soon be able to tell the difference between various materials such as sand rock wood iron an lao on sone; each material refle the sound waves differently because of the

The Voice of the Sea (Continued from page 71)

fish and the richly colored sea gardens of the Pacific at Santa Catalina At San Diego the yachtsman finds his paradise blogo the yearnings in the his persuase while at Coronado one may watch the feathery spray stumbling gloriously over the breakwater The long high ridge of Point breakwater Fhe long high ridge of Point Loma overlooks the bay while from com-manding view points the desert mountains of Mexico blend softly with the aky On summer days I have followed the

rolling hills along the ocean to the south of San Francisco peering over precipitous bluffs at tiny curving beaches bounded by rocky headlands and outlying reefs of tilted strata on which the seals and the white gulis play The long blue waves of the Pacific break with stately rhythm on the sand or tower in spray upon the rocks and the voice of the sea is sweetes music to the ear Come with me through the grain fields dotted with golden poppies over the flower-strewn hillsides it yous with birds and butterflies down through thick cedars to the singing sands of the seashore down to the long brown kelp and the way

ing mosses!
The sea is a symbol of eternity The sea is a numbel of eternity. As we become more deeply acquainted with it we more truly love its mustery and more clearly understand its message to our hearts. There are silent moments upon the mountains when one feels the immensity of nature and there are storms upon the eas in which our calizest the presence (f an immensionable power called the but invert in part to whose heart the lower than the part to whose heart the silent when the part to whose heart the silent when the part to whose heart the silent was the s mountains and the sea have never spoken Both supply an infinite need of the soul olit i le of the mountains and in the voice of the storm-driven sea there companionship with the Eternal

Curved or "S" Courses (Continued from page 72)

yards longitu linally and 110 yards literally Those errors are what may be ordinarily expected in mortar firing at a vessel steering an 9 course The sinuous course causes a loss in litting power of mortar batteries of about 50 per cent so that only high velocity rifles should be used in future installations. rifles shill be used in future installations, confining the use of morters to special curses the result of these tests demon-strated the vulnerability of coast defenses armed with morters when bombarded at armon with morears whosh comparates as long range by warships steering a sinuous bombardment curve. As a result of the invention of the Automatic Course Indi-cator the firing system and armament of coast defenses will have to be radically

'In regard to gunfire a leaser but very material error is introduced. In the case

LEGAL NOTICES

IF YOU HAVE AN INVENTION which yet which yet which to patent you convite fully and fleady to filters & Co. for advice in regard to the best way of obtaining protection. House sould actathose or a model of your investion and a description of the device, explaining its operation.

captaining its operation.
All communications are arrively or tial. Our vast perotice, esteending period of seventy years, cashies us leases to advise in regard to paten without any expense to the client Band Beek on Prisants as sent is request. That explains our methods

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of 12-inch guas the prediction interval is only 40 seconds and time of flight from 15 to 40 seconds and time of flight from 16 to 40 seconds The error appears to be proportional or nearly so to the time inter-val at a high the future position of the sinp on the 8 course must be guessed. On a straight course the average error in the ast-forward point is about 24 yards. With forward point is about 24 yards With the target hand-on when steering in 18 ourse at ranges between 7 000 and 12,000 yards the total probability of hitting is reduced by 25 per cent and with the target brea laid the sanous course at 8 000 yards range reduces the longitudinal probability of hitting about 10 per cent At the longer ranges 18 000 and 21 000 yards, the sinuous course will give an attacking fleet more immunity than now from rifle fire When sj. thring is resorted to the error will be far greater even than that indicated

The importance of these tests cannot be too stringly emphasized. As the mor-ter and guider from a land battery having a long horizontal and high vertical base line at 8 000 yards range was seriously line at 8 000 yards range was seriously affected him much more will be the affect upon guafiring between battle fleets at 19 000 yards range which resort to spotfiring! A fleet on an 8 course will be much more immune from the enemy a guns while her own control officers knowing the 18 course can after their ship's fire as the curve changes.

The Final Solution of the Airship Problem

(Continued from page 78) owing to the fact that the outer cover is owing to the fact that the outer cover is made as a rule of a non-gas-tapit material thus silowing for some renewal of the air certain constructors boriaum for instance provide means for ventilating the ring space at will by means of a system of valvas Of course all these are merely peace time risks which in time of war are further complicated by the intervention of hostile airplanes firing incendiary bullets—as the list of German Zeppelin losses proves with considerable forcefulness—It is small wonder then that as long as the industrial production of behum had been considered production of neutum and been considered impossible the airship should have been condermed for all but some special pur poses more distinctly navel fleet scouting coast patrol and submarine chasing. It is perhaps not unfitting to add bere in view of what has been said about the drawbacks. of hydrogen that the officers and crews manning airships in time of war are ex-ceedingly gallant men—be they even

The Virtues of Helium

The Vertues of Helium
It may seem strange that an article
which purports to extol the virtues of
helium as a lifting gas—helium which the
Navy Dipartment camouflaged for reasons
of national security as argon until the
war was won—should pay so much attention to the drawbacks of hydrogen.
But as matter of fact it is only by this
appreciate fully the profess he made to the
over since Giffard's days has obstructed
the lygical davelopment of the simbilip into
the acreal liner and battleship
Helium bousdes being, as has already
Helium bousdes being, as has already

Helum besides being, as has already been said absolutely non-inflammable, also rifuses to be absorbed and therefore, construction of the construction of a revolution an earth anyagation. As against this very great advantage helium possesses only as small drawback with respect to hydrogen is ill'integ force is about 9 or cent annular than that of hydrogen possesses only as and drawback is and the third of the construction of the constructio



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The savance which the quantity production of helium promines to effect in the obscination as well as in the application of the production of many already forease that, with the fire rate back

Back

Back

The savance which the quantity production of the geneous enzemble almost absolute arram line shape, greator structural strength and better all round performance. That such progress will benefit civilian as much as— if not more than—military and naval pursuits seems a foregone conclusion

Battleplane Armament (Continued from page 75)

The armored plane has appeared on various occasions in the great war, usually on the German side Such attempts to on the German sade Such attempts to protect armen and engines have generally proved a failure for the reason that th loss is speed and climbing ability has much than offset the gain in protection from hostile small-arms fire Indeed, such hostile entail-arms fre Indeed, such machines have only too often fallen votume to artillery fire from the ground A typical armored plane designed by the Germans for operations against troops on the ground was brought down by the Americans during the closing days of active fighting. This machine, which was probably of the Junker type, was a two-seater and carmed three types of the property of the state of the property of -one firing directly ahead, one mount d guns—one firing directly ahead, one mount don a tourelle, and the third attanged to fire through a well in the floor at targets on the ground

All in all, the tendency has been to in

All in all, the tendency has been to in crease the machine-ginu wherever feasible but considerations of speed and elimbing the control of the

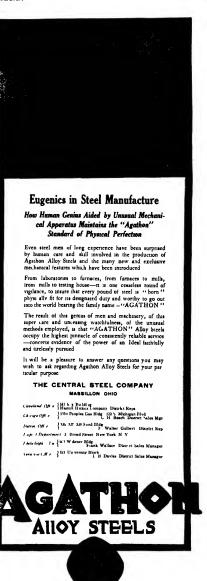
The Principles of Camouflage (Continued from page 76)

plane, aeral photography became a more important factor than visual observation in much of the reconnuisance. This neces-sitated that camouflage in order to be accessful had to meet the requirements of the photographic eye as well as of the human ave. In other words the second the photographic eye as well as of the human eye. In other words the spectral characteristics of the colors used had to be similar to those of Nature's colors. For example, chlorophyll, the green coloring matter of vegetation, is a peculiar green as compared with green pigments. When examined with a spectroscope it is seen to reflect a band of deep red light not reflected. by ordinary pigments So a photographic plate or spectroscope will reveal a differ-ence which the unaided eye does not Some time before the Great War began

it occurred to the writer that colored filters could be utilised in aiding vision by in count De utuned in along vision by in creating the contrast of the object to be viewed against its surroundings. Studies were made of various filters, in view ing the uniforms of various armics. Further ing the uniforms of various arms: Further developments were made by applying the same principles to colored lights and painted pictures As a result of the demand for avoiding detection by photographic plates and by various colored filters, some paints provided for the amountlear were developed according to the appetral ro developed according to the apearan re quirements. Many other applications of senance were developed so that camouflage can now be called an art based upon sound

can now be called an art based upon sound seantific principles

Natural lighting is so variable that it is ofcen impossible to provide exancidings which will remain astudedory from day to the control of the control of the control to provide the best compromise. There are were sources of light in the daytime, stamely the sun and the sky. The venders amounts of light control of the standardly changing. The sky on cloud-lises days succircles the rose, to the for the



Mr Frank H. St tory of the great waris a very remarkable work. It is not too much to say that no other man in this or any other it is hard to say what most f the war which is shown, or

country can quite parallel the work that Mr Simends has done. It to admire: the really extraordinary greap of the essential facts of ti the transparent clearness with which the facts are brought out or rought out or the entire fair

F. Once in a generation, perhaps, there appears one man with a gift for writing history so that all men all women all children like to read it. Such was Rid. path such were Macaulay and Herod-otus great of vision brilliant of style with a genius for facts and a genius for telling

Frank H Simonds is this generation s Riduath this war s Macaulay From the

day when this man burst like a flame upon the people of the city of New York with his prophicy of the great war, to this day, his projectey of the great war, to this day, when he is welcomed by Allied statesmen and generals his fame has spread about the world Already today, clubs and schools are studying Frank H Simonds His least newspaper article is treasured and passed from hand to hand. So it is wonderful indeed that at last you can



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th Simonds brilliant contempora-flictory of the War—an intellig at i an can feel that the meaning fit o war will not be lost for him and his And those boys wh have some back one will had in it the truth all it the thought they head of it in red they will had all that just of the war that they had sever seen

blumens Size 10 % x 7 % x 1 % 1000 Illustration with the control of american and unity of the first the control of american and the six the order of the first three control of a mention of the six of the first three control of the first

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you to own Many of the west maps were drawn by Mr. Sisseads bisself. The illustrations are printed on special payer isserted for the purpose. Many of them are entirely new to the eyes of readers, having been from cut of the headron's of thesesses that here been taken in this war—those are pictures you really went to keep—that realing liberted the device of the headron's pictures you really went to keep—that realing liberted the settlement.

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I fed sure the work of Mr Simonds will prove a valuable contribution to the literature of the World War The volume in head makes easy pisseant and interesting reading

or thin his

total light received by a horizontal surface at moon. Light from the sky and light reflected from the surroundings illuminate the shadows. These shadows are different in color from highlights because color be-comes less comprisons as the distance of observation increases. In general distribution of brightness of light and shade in the most important aspect to be comsidered

The camoufisur worries over shadows The camoussur worries over singulars more than any other aspect generally On overcast days camouslage is much more successful than on sunny days Obviously countershading is resorted to in order to sliminate shadows and where this is unsuccessful confusion is resorted to by mak-ing more shadows The shape and oriening more analows 1 me anape and oren-tation of a building as very important to those charged with the problem of render-ing it monspicuous to the enemy, but little attention has been paid to these aspects

those charged with the problem of rendering the monganeous to the seamy, but lattice attention has been paid to these aspectation of the problem of the problem of the problem of the factory dull green will be detunguabable by its shape as indicated by its shape as indicated by its shadow and shaded sides In this some a hangar for example, would be more reachly concealed it its length lay north and south Its sides could be brought with a gradual ourve to the ground and its rare, which has concealed it its length lay north and south Its sides could be brought with a gradual ourve to the ground and its rare, which has effectively treated to conceal the shadow A little thought will convenie the reader of the importance of shape and ormentation. Broken color or pattern is another fundamental of camouflage which, of ourse, must be adopted to its environment. For our trucks, cannon, and many other implements is that of the blacking of these colors at a distance, where the eye no longer receives the individual patches, to a color which attendates the general law. For example, red and green patches at a first patched and green patches at a classification of the patched of the patch

In constructing such a pattern of various colors it is also desirable to have the final mean brightness approximate that of the general surroundings. This problem can be solved by means of the photometer and a formula provided which states, for example that a certain percentage of the total area be painted in gray, another percentage in green, and so on The photometer has played an important role in establishing the scientific basis of camou-

meter has prayed an important one of establishing the selectific base of camourtees.

Where the artist is concerned with a background which does not include the aby, that so, where he deals only with silventened objects on the earth, his trained eye is valuable provided the colors used meet the demands made by photographic plates and colored filters. In other words, the sky as a background, gives trouble to all who are unfamiliar with scientific the sky as a background, gives trouble to all who are unfamiliar because of sky and colored sites or the colored size or the colored size of the colored size or ordinarily encountered. One of the most conspicuous aspects of Nature's surface is its texture From great heights it appears flat, that is, polling land is fromed out and the general contour of the ground is flattened. However, the slament of texture always remains. This is the oblicit reason for the extensive use of

simment of texture always remains This is the oblif reason for the scienaire use of acting on which dyed raffis, foliage, places of optored lottin, etc. are test Such medwork has concealed many guns, head-quarters, armunition dumps, communication than been well done the concealench is perfect. The of the gractest schenyrances to the monthlers is the leafs of definess or "factions" of the perfect of the gractest schenyrances to the man of the perfect of the schene of the perfect of the schene of the perfect schene of the perfect of the schene of the schene of the perfect of the schene of the perfect of the schene of the perfect of the schene of the s





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the other media used. When viewed at some angles the glint or highlight due to specular reflection renders the work very conspicuous For this reason natural foliage or dyed raffia has been used

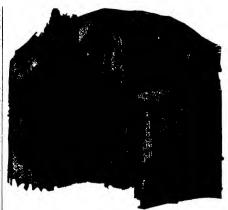
Systems of network have been exten-sively employed on roadways near the front not for the purpose of concessing from the enemy the fact that the roadways exist hut to make it necessary to shell the entire roadway continually if it is hoped to pre

vent its use

Although the camouseur is provided with a vast amount of material for his work many of his requirements are met by the material at hand Obviously the most OTAL DESIGNATION SOLVEN convenient method of providing conceal ment for a given environment is to use the materials of the environment Hence rubbish from runed buildings or villages Upright Drills supply camouflage for guns, buts, etc., in that environment. In woods the material hand. The color of the soil is important for if it is conspicu ous the camoufleur must provide screens or natural turf

In this great game of hoeus poeus many deceptions are resorted to Replicas of large guns and trenches are made, dummy soldiers are used to foil the super and make him reveal his location and paper make him reveal his location and paper makeh horses, trees, and other objects con-ceal snipers and observers and afford latening posts. Guinners have been dressed in summer in green flowing robes. In winter white robes have been utilised. In the foregoing only the highlights of a vast art have been viewed but the art is still vaster for it extends into other fields Sound must sometimes be camouflaged and this can only be done by using the same medium—sound. In these days of scientific warfare it is to be expected that the warfare it is to be expected that the positions of enemy guns would be detected by other means than employed in the past A notable method is the use of velocity of A notable method is the use of velocity of sound Records are made at various stations of the firing of a gun and the ex-plosion of the shell By ample tray-nometric laws the position of the gun is ascertained it is said that the German-fired a number of guns simultaneously with the Temple is in order to experiwith the 75-mile gun in order to camou-flago its location The sirplane and submarine would gladly employ sound camou-flage in order to foil the sound detector if practicable solutions were proposed

The foregoing is a brief statement of a new of the fundamental principles of land camouflage. Let us now briefly consider the eyes of the enemy. Of course, much concealment and deception is devised to concealment and deception is devised to foul the observe who is not the ground and fairly close. The procedure is obvious to the average imagination however, the reader may not be acquaited with the actial cyes from which concealment is very important. As one ascends in an arrighas to view a landscape he is impressed with the madequacy of the eyes to observe the vast number of details and of the mind to retain them Field glasses can not be used as satisfactorily in an airplane as on the ground owing to vibration and other moveground owing to vioration and other move-ments. The difference is not as great in the huge flying boats as it is in the ordinary airplane The camera can record many details with higher accuracy than the eye At an altitude of one mile the lens ca used at full aperture and thus very short exposures are possible. This avoids the difficulty due to vibration. When the difficulty due to vibration. When the plates are developed for detail and enlargements are made, many minute details are distinguishable. Furthermore, owing to the fact that the spectral sensibilities of photographic emulsions differ from that photographue emulatons differ from that of the eye contrasts are often brought out which the eye would not see This applies also to camoufage which is devised merely to suit the eye Individual footparts have been distinguished on prints made from negatives expected at an altitude of the contrast to the process of the property of the contrast process of the process of the process of the contrast process of a tree from its dramp of these parts are the process of a tree from its dramp of the process of a tree from its dramp of the process of a tree from its dramp of the process of a tree from its dramp of the process of a tree from the dramp of the process of a tree from the dramp of the process of a tree from the dramp of the process of a tree from the dramp of the process of a tree from the dramp of the process of a tree from the dramp of the process of the process



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position It has been said that the anemy is a motor leanable in the possibility as a motor leanable in the possibility of the p iso provude clearance for newly placed guas By paths convurging towards a certain point, it may be concluded from the photographs that an ammantion depot or headquarters is lo ated there even though the position takef were will camoufaged. Continuous photographic records may reveal dis-turbances of turi and lead to a more carr-ual impection of the region for sapping operations etc.

Decoy Ships for Submarines

(Continued from page 77)
Thus, the action of the decoy "Q-5" is de-

ecribed as follows
' H M S 'Q-5' was struck by a torpedo th M S U-b was struck by a common abreast of No 3 hold Action stations were sounded, and the panic party abandoned ship The engineer officer were sounded, and the pastic party abandoned ship. The engineer officer reported that the engine room was floeding, and was ordered to remain at his post as long as possible, which he and his staff, long as possible, which he and his staff, several of whom were severely wounded, most gallantly did The submarine was observed on the starboard quarter 200 yards distant, watching the proceedings through his persacope. He ran past the ship on the starboard side so closely that the whole hull was visible beneath the surface finally emerging about 200 yards on the nort box on the port bow

I he enemy came down the port side of the ship and fire was withheld until all guns could bear at point-blank range The first shot beheaded the captain of the submarine shot beneated the captain of the submarine as he was climbing out of the couning tower, and the submarine finally sank with conning tower open and crew pouring out lhe action may be regarded as the supreme tost of naval discipline. The

supreme test of naval discipline The cluste engineer and engine room watch remained at their posts to keep the dynamo working until driven out by the water, then remaining concealed on topy of the cylinders The guas crews had to remain concealed in their gun bouses for nearly half an hour, while the ship slowly sank lower in the water Commander Gordon Compbell for this zotion, was awarded the

Campbell for the action, was awarded the Victoria Cross*
One scarcely regards a little 200-ton schooner as standing much chance in a fight with a U-boat, so the following official story has special interest 'Louit William Edward Sanders, R NR was awarded the Cross for an action of H M S 'Priss' on April 26th last 'The Trace a topscal schooner of 200 complete of 20 ship The ships head was put into one wind, and the guns crews concealed them-selves by lying face downwards on the

300-ton collier, commanded by favr designer

"Luett Harold Auten, V. C., 2D, 6 C., R N R, was in command af H M. 8

Stock Force' on July 30th, 1912, when she was torpeded by an ensury submarine at 5 P M The torpede struck the ship abreat No 1 hastel, sarticely wrecking the fore part of the skip, bedueling the bridge, and wounded by beats, marpholed shells, hatches, and other debries of the struck of the s where the surgeon (Surgeon Probationer G F Strahan R N V R), working up to his waist in water, attended to their injuries. The captain, two guns' crews, and the engine room staff remained at their pusts

"The submarine then came to the sur-face shead of the ship half a mile dutant, and remained there a quarter of an hour, apparently watching the ship for any doubtful movement. The 'panic party in the boat accordingly commenced to row back toward the ship in an endeavor to in the boat accordingly commensed to row back toward the ship in an endeavor to decoy the submarine within range of the control of the submarine within range of the control selved to the submarine within range of the "fitted Force," about 300 yards away, Lieutenant Auten, however, withhald his fire until abe was aboam, whan both of his gues could bear Fire was opened at \$60 P M, the first shot carried away one of the submarine of the submarine of the rest to the submarine of the waterline, tearing her open and blowing out a number of the crew to the submarine on the waterline, tearing her open and blowing out a number of the crew to the submarine on the waterline, tearing her open and blowing out a number of the crew the submarine of the submarine of the submarine of the submarine submarine the submarine submarine the submarine submar

man (Omer's neward, Second Class, R.
J. Starling), remained pinned down under the foremost gun after the explosion of the terpedo, and remained there cheerfully and without complaint, although the ship was apparently smiding, until the end of the

The Sahara Hydrological Station

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The enemy contanued deliberately all the enemy contanued deliberately all the enemy contanued deliberately all the enemy contanued and the enemy contanued and the enemy contanue and the enemy cont



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The White Trucks were all veterans, many in continuous war service since 1914.

"White Trucks Have the Stamina"



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were located in one place they
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New Test of Transportation Efficiency for Packard Owners Starts February 1st

Test Covers One Year's Operation—Drivers, Accountants and Shipping Clerks to Share in Cash Prizes of \$17,640.00

How much work can a motor truck deliver? What ought to be the cost of doing the work?

HESE are two of the most pressing questions in American business to-day—what with the railroad congestion and the need to save freight cars; with the staggering quantity of mer-

cars; with the staggering quantity of merchandise to be moved; and with the great business expansions already taking shape.

Motor truck efficiency means not only gasoline economy, tire and oil saving, and repair economy.

It means also the right size truck for your average load; efficient routeing; saving of time in loading and unloading; the way the truck is handled all along the line.

It means standardizing costs—every item fixed and known.

Basic principles, all of them—and the purpose of this new National Truck Efficiency Test is to show the Packard owner how these basic principles can be applied to his individual business. The test covers one year's operation—demonstrating what can be done under all conditions of weather, temperature, road and load.

The Packard owner may enter as many of his Trucks as he wishes.

Prizes are not only awarded to the *Driver*, for keeping his cost down in relation to his service; but to the *Accountant*, who tabulates the records; and to the *Shipping Clerk*, because much of truck efficiency depends on efficient work at the shipping platform.

A Packard Truck of any sise can compete on a fair basis. Trucks are classified according to capacity into Divisions.

Here is where the owner will learn whether his truck is just the right size for his work—or too large, power lost by running on underload—or too small, necessitating overload to get his hauling done.

The Packard owner starts the test with the basic principles developed by the Packard Organization of transportation

He has a year to apply these principles to his individual business.

specialists.

What can he not achieve in . efficiency!

How to Enter Your Trucks in the Packard National Truck Efficiency Test

Your local Packard Branch or Packard Dealer will accept your entries and see that your Packard Truck of Trucks are formally enrolled on the Official List of Contestants

THE Test starts on February 1st, 1919, and continues to January 31st, 1920.

Trucks are divided into seven Divisions,

"A" Division—all 6-ten Trucks
"B" 5-ten
"C" 4-ten
"D" 4 1-ten
"E" 4 1-ten
"F" 4 1-ten

The Grand Total of Prizes is \$17,640.00 - including five prizes for Drivers, Accountants and Shipping Clerks in each Drouses—as follows:

 PRIZES
 Definer
 Associates
 Shipping Clark

 1st
 \$500
 \$125
 \$225

 2nd
 400
 100
 175

 3rd
 300
 75
 125

 4th
 200
 50
 80

 5th
 100
 23
 40

Contestants shall be Packard Trucks only.

All costs and operating shall be kept and submitted on the standard forms of the National
Standard Truck Cost System, which can be obtained through your Packard Branch or
Packard Dealer.

Recapitulation or operating and cost data must be submitted monthly by owner to the Packard Factory for inspection and correction.

PACKARD MOTOR CAR COMPANY, Detroit

SEVENTY-FIFTH YEAR OUR DESIGN OF THE SECOND OF THE SECOND

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX |

NEW YORK, FEBRUARY 1, 1919

10 CENTS A COPY



Paravane hasied out of the water, showing the hinged cutting jaw, plane member, rudders, and floats



This paravane caught a small shark instead of a deadly mine in its cutting jaw

The Paravane-A Steel Shark Which Protects Vessels in Mine-Infested Waters

Vessels in Mino-Intersor waters

THE naval mine as a far more treacherous weapon
than the torpede. It gives no warming of its presence
as it swings some distance below the surface, ready to
strike a crushing blow the moment it is touched by a
ship. In the great war the mine has scounted for
many ships, among them the British dreadnaught
"Audadoins" and the American crusser "San Diago,"
the latter having been sunk off the coast of Long island
indeed, the German, fully resting the "betterenes of
the marks into enemy waters with the
object of sowning mines at the entrance
of harbors and in the well-known
shipping lanes.

est harpors and in the shipping lanes
But whatever may have been the destructive qualities of the mine as compared with the torpedo its actual arealy cur-

destructive qualities of the mine as empared with the torpsed or its actual effectiveness has been largely cruzilled by the introduction of a protective derive for vessels crossing mine and the parawane, and it is moorn as the parawane, and it is reported to have been instrumental in making the German mine fields more or less impotent against Allied vessels. Brisky described, the parawane may be said to comprise a hollow torpsed-shaped body, a plane member temulating in two floats, horacontal and wetled to the said of the said o bow is about ten feet below the sur-face, and each persyma maintains a parallel course about twenty-five feet sway from the ship's side. As they are being towed at a depth of about ten fact, the persymane can be plainly some from the deck of the ship, hav-ing much the appearance of sharks.

The plane member and the rudders of the paravane, as The plane member and the rudders of the paravane, as well as the position of the towing cable maintain this device at the proper depth and hold at to the parallel course. Audie from the towing cable there is another cable connecting the paravane with a small boom or dart on the for eitle. The purpose of the cable is to hauf in the paravane, as well as to operate the cutting aw in the more recent my this. Phe hauling call is in pulled taut while the other call is a practically free from stram examt when it is working the cutting the cutting the stram count when it is working the cutting the stram count when it is working the cutting the stram count when it is working the cutting the stram count when it is working the cutting the stram count when it is working the cutting the stram count when it is working the cutting the stram count when it is working the cutting the stram count when it is working the cutting the stram count when it is working the cutting the stram count when it is working the cutting the stram count when it is working the cutting the stram count when the stram count w stram except when it is working the cutting law

Given two paravanes and two taut cables which form a V-shaped fender at the bow of a ship it is a simple matter to understand what happens when such a com

bination enters a mine field. The mines, which are anchored to the sea bottom by means of steel cables, are taken care of as depicted in the sketch. The paraare taken care of as drotted y me and a feet each care of as a choice of the care of as a choice of the care of th

more recent form the second cable of the paravane extends from the jaw to a winch on board the ship. The winch is arranged to operate continuously, but allows the cable to ship each time it has been wound up tightly. Thus the cutting jaw, which is hinged in this case, is alternately opened and closed so as to act as a pair of power-ful shears.

Most ships traversing mine-infested waters have been equipped with the waters have been equipped with the paravane American transports have all been equipped with the device The "Leviathan," for instance is understood to have carried four understood to nave carried your paravanes on each trip, two for use in mined waters and two in reserve At the high speeds made by this giant transport much troutle has been ex-perienced with the paravance, and it is said that a trip was seldom made in which two or three were not lost in fact, it is the difficulty of handling the paravanes on high-speed ships that has often tempted the crew to get along without them although they are recognized as a reasonably sure form of mine protection. On slow vessels, however, the paravane is readily managed



Arrangement of puravanes on a ship traversing mine-infected waters

(Continued on page 108)

SCIENTIFIC AMERICAN

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The bjet of this jurnil to to record accurately and lucidly the latest evertific mechanical and industrial news of the day. As a ucokly jurn it is in a post tion to announce interesting developments before they ars published elsewhers

The Edstor is glad to have submitted to him timely articles suitable for those columns especially when such articles are accompanied by photographs

A World in the Re-making

ITH all Furope busy in reconstruction and has so enshrouded the activity of the past four years a vast store of interesting and valuable ma ternal is to be had on the other side of the water have sent our well known Washington correspondent Mr C H Claudy to tap this reservoir for us and his articles will feature our pages, we hope for a long time to come We direct the attention of our readers to his first communication which appears in this Issue

Sublime Heroism in the Navy

HE United States Navy is held in high esteem by the American people and its personnel officers and men alike, have an assured position in our regard and affection Although these sentiments have en greatly stimulated by the fine record of the navy during the present war, they are not local or ophemera Pride in the navy and affection for its officers and gallant lads are as old as the nation itself. They had their birth with the birth of the Republic and ships and men alike have served to build up on all the seven seas that tradition of patriotism courage heroism and chivalry, which is the navy a most cherished posses

They had no traditions nothing up to which they had to live said an officer of the victorious fleet in explaining the wholesale surrender of the German fleet

Naval tradition-how swiftly the men and ships who made it leap to our minds! Paul Jones and the homme Richard Farragut and the Hartford Dewey and the 'Olympia Rodman and the New York, with all the men who, on destroyer, scout and transport faced that modern terror the pirate submarine in the bitter cold and furious weather of European waters

But it is not of heroisin in battle on the high seas that we wish to speak just now but of heroism of another kind and place We wish to offer our tribute to the brave lads of the navy who as mentioned in the adjoining column deliberately courted death in the quiet of a sick ward filled with victims of that dread disease influensa

The psychologists tell us that heroism is a complex of many impulses and emotions particularly when it is displayed in the heat of battle. Lack of these adds its stimulus of pride batred anger desire for fame and reward patriotism and self sacrifice. There is also the inspiration of comradeship and the stimulating leadership of the officers One or several or all of those combine to carry the men forward to heroic deeds

But when those sailor lads in Boston and San Francisco entered the sick ward bent over their stricken comrades and deliberately breathed in the pestilential exhalations they went over the top with just the simple motives of patriotism and self-sacrifice. Unarmed and naked they faced a fee that had slain its citizens of their own country

They knew perfectly well what they were doing for aught they knew the great world outside of that quiet ward would never learn of their supreme sacrifice No mapiring bugle note called to duty no onlooking army spurred to action, no decoration was flashed before their eyes—no reward save that which comes when a man's own consusance whispers to him. Well done own conscience whispers to him, Well done (greater love bath no man than this that a man lay

down his life for his friends '

We suggest that the Navy Department make knows the names of these hundred satiormen who volunteered for this hazard of death. Thus will our naval tradition be enriched and their names and their sacrifice be honorably perpetuated

The Influenza Mystery Deepens

OME time ago in commenting on the spread of epidemie influenza, we spoke of the disease as a disease of mystery ' That this is even more true today is indicated by experiments just made public by the United States Public Health Service

It may be recalled that medical scientists are by no means agreed as to the nature of influence influence bacillus discovered by Pfeiffer in 1802 has, it is true been found associated in a large proportion of the cases during the present world wide epidemie, but the best opinion looks upon this bacterium as more probably a secondary invader, and holds that the true causative micro-organism has not yet been isolate

Some months ago, Nicolle a well-known French bacteriologist reported the results of a series of experiments which indicated that the virus of influence was ultra-microscopie and able to pass through filters of unglased porcelain. This announcement appeared the more credible since the investigations by Foster, an American army surgeon, had already shown that common colds are caused by a filterable virus

Quite unexpectedly, however Rosensu of Harvard, made public the results of experiments which he believed indicated that the virus of influensa was not filterable He introduced into the nose and throat of a number of volunteers filtered secretions from active cases of infuenza and failed to reproduce the disease Careful examination of the protocols of Rosenau's experiments showed however, that he had failed to test the infec-

tivity of the unfiltered secretion

It was to remedy these defects in the investigations that a second series of experiments was made, this time in cooperation with the Hygienic laboratory of the United States Public Health Service In this investigation, which was carried on both in Boston and San Francisc over one hundred men of the naval training station volunteered to submit themselves to experimental in oculations By means of sprays and swabs filtered and unfiltered secretions from active cases of influence were transferred to the nose and throat of the volunteers In addition to this pure cultures of Pfeiffer bacilli were similarly introduced, for, after all it was still important to know whether this could produce typical influensa. much as possible, a group of volunteers brought into a ward in which were active cases of influenza lean sch of ten bod patients, conversed a few minutes and allowed the patients to sough into their faces

And the result?-in not a single instance was influensa thus produced in any of the volunteers!

It is of course, possible, that in influence the virus is present in the masal secretions for only a limited period This is the case for example, in measles In yellov too, we know that the virus exists in the blood for only a few days so that search made before and after that sriod invariably yields negative results

By analogy there is still every reason to believe that influence is most commonly spread by droplet infection, succese and spit This, too, as the view of Surgeon-General Blue who warns against a musinterpretation of the experiments just cited. More than ever, therefore influenza is to be regarded as the disease of mystery

Round Pegs and Square Heles

ERHAPS in no field of science has the war stimulated such sudden and such notable advances as in that of the psychologist. He has had unprecedented opportunity to observe the behavior of men under conditions of stress and he has been called upon to make tests, and perforce to devise machine and methods of test, on a stale never before contem-plated He has proved his technique to himself and to others he now stands on a level of achievement and recog-nition impossible of attainment is years of normal activity

Four weeks ago we thus summarized the year's develop-ment in this science which has so heavy been transferred from the reaim of the inexact to the entegory of the smoot we then supposed that, having graduated into the class with the exact scientist, the psychologist would still, here to go a long way toward overcoming popular is before he could show definite evidence of his accept as a practical scientist, an engineer But any expect tion to the contrary notwithstanding, the payob has just made a real advance toward that very goal is announced that Columbia College will, in Septem abandon the old system of entrance examinations. substitute psychological tests to determine the stu mental capacity

As in the past the candidate for admission will be required to exhibit his school record Instead of pro-ceeding on the theory that this certificate is open to suspiction, however, the College will accept it without more ado as evidence that the student has eatis academic prerequisites for college work. Having thus graded his learning, it will then proceed to grade his intelligence by means of tests of substantially the sort adopted by the Army These tests will be interpreted in connection with the candidate s history, to determine whether or not he can profitably be asked to continue his schooling Dean Hawkes hits the nail on the head when he says "We expect these tests to show us whether it will be worth our while to try to educate the student, and whether it will be worth his while to have us try

This is a radical departure, but, we believe, not too radical a one Set examinations are not of themselves objectionable, if the student has not sufficient contro over what he has learned to meet the examination with success, he has not sufficient control to meet practical situations where he is called upon to use his acquired knowledge For this reason, we have little sympathy for the student who complains that his peculiar temperament prevents him from doing himself justice in an exam-ination. If he can't command his learning when he need it, what possible sense is there in his acquiring it

It is, therefore not at all on the ground of any objetion to set examinations, as such, that we hasten to endorse the proposed change. It is rather on the ground that in passing his preparatory school courses the student has already subjected himself to a more or less severe examination, and has emerged from it with succ has always impressed us as a tremendous waste of effort to examine him seriatim every winter and spring for three or four years, and then do it all over again m one wild week preceding his entrance to college

It will of course be urged that the percentage of students who come up with good school records and fail to handle the entrance examinations is sufficiently large to show that this repetition is necessary We believe, on the contrary, that the preparatory schools are lax in their examinations and in their awarding of certificates, because the certificate of the school that John Smith has passed his plane geometry really means nothing save that he has attended the course in plane go It has this restricted meaning because the collrefuse to allow it any other The school can, therefore, afford to thrust upon the college the responsibility of telling the student that his school work has been badly If, however, the school certificate were accepted at its face value, it would be well understood that an undue number of cases where students from a particular school turn out to have inadequate preparation would result in refusal longer to recognise certificates from that school. Then the school would have to shoulder its own responsibilities, and the result would be better for the ol, better for the student, better for the college

The innovation which Columbia has adopted will further result in more intelligent selection of the stu body Under the old system, anybody who can be crammed with enough facts to get by the unaminers gets into college, he may not stay long, but he gets in The fact is that while a certain specific preparation is neces-sary before a student can attend college profitably—just as we must build the anchorage before we can erect bridge-it is by no means the most important factor.

What should constitute the determining factor in admitting students to college is precisely those qualities of general intelligence and maturity of mind wh ence or absence is revealed by the psychological test. This test is, therefore, more significant than the old one. Columbia has done well in bringing should this innovation.

Naval and Military

Skircean Inich vs. Eighteen-Inich Ounn.—The renewal of the 18-insk game from the British cruser "Furious," because their dicharge stressed the ship a structure too heavily, suggests that our 16-inch fiftysciller gam is about the limit of weight and power for nevel ordnance. Our gun weighs 128 tons and its shell \$1,000 pounds, the shell of the 16-inch gun much have weighed come 3,000 pounds and 6-inch gun much have

The Submersizes is Blind and Slow—La spite of the fast that the Ridds have some estam-drawn, 2,700-ton submarines, capable of a surface speed of from 23 to 58 knots, the submarine, as a reapon of war is too slow and too blind when it as submerged to be considered a sections weapon or naval warfare. When it can see alsotsteadly, to a distance of 10 to 15 miles while it is an assummarged on deeply as to be invisable to the aircout and when it can steem 20 knots submerged, it will dominate the navy mixture mixture of the submitted of the submitted

Tank Used for Hauling Barges.—The French have recently made an interesting demonstration of the evaluability of the tank for water transportation. On a recent occasion, one of these former angines of destruction was put to work on the Marna Canal near Eperacy by the Ministry of Public Works The tank haulied a large sourcy of barges at a speed of nearly two miles an hour, which is double the speed that could have been ands with the same load hauled by horses or rules

How the Australians Bagged an 11-inch Gun— Describing how a German 11-inch rullroad gun was outpured by Qesenshand infantry, Figielt has the following to my "The Queenshand infantry may a train appearedly trying to get off one line and onto another to escape. In the ometer of the train was a great shoeted object. A British plane dropped a bomb near the engine which apparently damaged it, for a large cloud of steam was trained the crew, who were afterward expirated, were terribly seakled. The plane then dropped a bomb on the stall of the train, which blew up. An Australian segineer got up steam, unbooked the tail of the train, and shunted the run through to our lines

U. S. Shipping Board Teats Riccric Welding of Ships.—After schamsively investigating electrical welding, the Riccricial Welding Committee of the United States Shipping Board, Emergency Freet Corporation, is owell satisfied as to the practicability of this process, that it formally urged that a 0,300-deadweight-ton ship be built by selectrical welding. Thus recommendation has not as yet been approved because of the general sentiment among the body of experts that a smaller ship should be first constructed. Meanwhile, there is about to be built for demonstration purposes at the yard of the Federal Shipbuilding Corporation at Kearney N. J. a 45-doot electrically welded muchaip section of a 9,000 ton ship. The methods of assembling and welding to be used on this section are due to A. J. Mason, Consulting Engineer for the United States Shipping Board and member of the Electric Welding Commuties

The "Easie" Boats -The Ford 'Eagle" boats of which we are hearing so much just now were designed for anti-submarine service-work for which we have always considered them to be too small Lane officers would have preferred a larger craft and we believe that if our navel constructors had had their way and been left satirely free in the matter, they also would have designed a larger boat with better see keeping qualities. How fee Mr Ford had to do with the design we do not know, but we do know that speed of construction was a ing consideration. Hence the framing and the seal lines of the ships were drawn so as to reduce og and general working to a minimum mit the boats have straight wedge bows, with practically none of that flare which characterises all modern war vassels Consequently, they would be in trouble driving into a head sea or running before a following sea, which inter seas they would be very difficult to steer they the scantization of kay more of these boats wild be shaudoned, or the design should be modified to give them better ass-keeping qualities Testimony we receively given before the House Naval Committee that 113 maps reclaimed, that 7 have been practically som-planted and that 8 are searly for commensor. The con-lineate fage 45 we more have been cascaded. The con-tents given are fulfill and sengites wer \$375.00; they have sent \$400.00.

Science

Negroes in the United States—The last annual report of the Director of the Consus announces the completion in readiness for publication at an early date of a compilation, in one volume of all the census statistics pertaining to the neger near that have been collected in this country from 1790 to the present time. This report includes, in addition to data from the decennial reports, annual mortality statistics relating to negroes for the vears 1900 to 1915.

Barthquakes in 1918—The official report of the Georgetown University Someological Station Washington, D C, shows that during the year 1918 there were recorded on the seamongraph 88 earthquakes. From dispatches received the location of 37 quakes of importance was ascertained. Of these three were disastrous the first occurring in Guatemials the second in China and the third in Porto Rivo No disturbance of any consequence is tabulated as having taken place in the United States.

E46 Substitutes —The U S Bureau of Chematry has recently turned its attention to the numerous accelled "egg substitutes now on the market concerning some of which extravagant claums are made on their labels, as to their food value and their ability to serve the purpose of eggs in baking and cooking Analyses show that many of these substitutes consuit seemitally of a mixture of stareh and baking powder colored yellow with a socil-tar dre A few contium caseun which is an ingredient of milk The food value of such preparations, says the Bureau is far inferior to that of eggs and experiments show that the substitutes do not have the effect of eggs in cooking Artion has already been taken under the Food and Drugs Act to prosecute the manufacturers of some of these preparations of some of these preparations.

The Mountainners of Tennessee -Some Interesting studies have been made by Dr Ales Hrdlicks, of the onian Institution on the Tennessee mountained specially as exemplified by 150 men called for examinan in the first army draft. His work commencing at Bristol, Tenn., extended to Mountain City and farther on into the hills. His studies do not confirm the idea that these mountaineers represent a separate type of Americans Among them are found some aples of fine physique while others are of relatively feeble mental powers or nervous stability perhaps due to the hereditary effects of alcoholms or other inherited defects. There are all grades of moun-" and no line of demarkation separates them from the people in the lower lands who are mostly of similar derivation. Many mountaineer families are remarkable for their size. One man of 83 was the father of 21 children, ranging down to three or four years old The draft, says Dr Hrdicka should prove a God-send to many of the young men many of whom are illiterate, and whose worst enemies are isolation, 'moonshine" whiskey, and in many cases poor heredity

Vital Statistics in the United States -From year to year the SCIENTIFIC AMERICAN has recorded the steady, though far too slow approach which this country has been making to a place in the ranks of those nations which possess such a system of collecting vital statistics as may reasonably be demanded of a civilized people According to the recent annual report of the Census Bureau for the past fiscal year, the registration area for death statistics has now grown until it embraces 28 states the territory of Hawaii, the District of Columbia and 42 cities in non-registration states. Thus it contain approximately 73 per cent of the total population of the country. The most recent additions were the stat of country e and the territory of Hawaii admitted for 1 117, and the State of Oregon admitted for 1918 The inclusion of Hawaii extended for the first time beyond the limits of continental United States the area for which the Census Bureau annually collects and publishes mortality statistics No state territory or city is admitted until a test has been made to prove that the deaths occurring therein are properly recorded under state law or municipal ordinance, and that the regustration is at least 90 per cent complete The Federal collection of birth statistics began in 1915 with a registration area comprising ten states and the District of Columbia and comprising ten states and the binting to Continuous and about 31 per cent of the total population. Ten states have since been added, and the area contains about 53 per cent of the country's total population.

Electricity

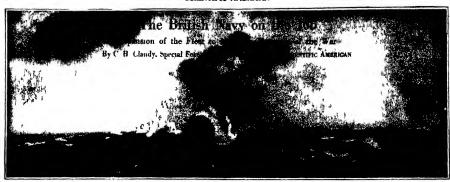
Fixation of Nitrogen in Japan —According to the Jondon Blectrican the Japanese Government has desided to establish a laboratory for the study of questions relating to the fixation of atmosphere nitrogen Hitherto 20 000 000 years worth of ammons for fertilisars has been imported and it is hoped to make Japan independent of foreign supplies

Again The Renewable Fuse Flug.—The latest renewable fuse plug to be placed on the market appears to be about as ample as could be desired. It consists of only three parts A one-pince porcelain body with outside thread to fit the cutout a fuse strip of the desired angusty and a muse disk cover. The fuse strip can be inserted in a few moments. It is pushed through a slot alongside the modified of the bettom pulled up made and bent through a slot near the top and over to the outside, being fastened in a little pocket at the bottom of the thread the other end is bent over the bottom button, thus forming the end contact then pushed through another slot on the opposite side of the button and bent over inside to prevent the end falling out when the fuse blows. After the mics is replaced, the plug can be put back ready for use.

Solution of Flood Lighting Problems -The socalled flood lighting which has found many special applications in the United States will no doubt become more familiar throughout the world in the no distant future From a recent article in the General Electric Review it is evident that such methods are already becoming standardised and with the data available for any particular projector it is easy to determine the resultant illumination on an object at a given distance or the number of projectors necessary to cover a given We notice that the illumination considered sarily varies according to the surface of the building or other object illuminated and its surroundings no doubt is quite natural as one would expect a higher illumination to be necessary in order to make an object stand out in a brightly lit thoroughfare than would be peeded if it stands alone amidst dark surrounding

Preumatic ' Fishing Device for Conduit Work -In conduit work where the wires are to be enclosed in metal pipe the joining of the conduit by no means terminates the task of the electrician mains the task of passing or fishing the wires through the conduit which is by no means a simple one where there are many elbows. New methods have done much to simplify this task. One of the most recent is a pneumatic fishing device consisting of a hand pump, pressure tank flexible air hose reel for cord, and a The traveler consists of a small shaft carrying three light disks which form a more or less perfect piston with the conduit walls as the eylinder When air ressure is applied the traveler is pneumatically impelled along the conduit whether it is straight or curved, and around all manner of bends and elbows A cord is pulled after the traveler When the traveler has reached the other end of the conduct the string can be employed for pulling the wires through

Maintenance of Accumulators in War Time .-In Elektrotechnik und Maschinenbau an account is recently given of some special difficulties leading to the breakdown of some cells in a buffer battery installed in the generating station of an Austrian street-railway The trouble was due to faulty maintenance, which is attributed to war conditions. Several cells were known to be in a bad way but could not receive immediate attention and ultimately one of them up shooting out long flames which could only be put out after the battery had been disconnected. The breakdown which was repeated shortly afterward on another cell was due to the destruction of the plates which fell away from the upper lead frame The level of the acid had sunk below this line of fraction the whole supply of 600 volts being thus interrupted an arc ensued and volatilised the lead. The author quotes this example as a warning to take care to keep the upper edge of battery plates well ammersed in the electrolyte. If the story had not appeared in a technical contemporary should have said that such circumstances could not have arisen in a civilised country But that raises other reflections adds The Blectracion, in abstracting the forecoung account



The battle cruiser ' New Zealand driving into a head sea

Tight the Britch Newy had two by man teaks to perform in the war and performed them by the wind performed them by the wind present of them by the wind generally admitted. It was to real Britain stack as possessing the greatest fleet in histry first to aweep the German flag from the seas and econd to so blockade the German I impre that its supplies from w thout had to come by tortious ways and secret mithode rather

than by ships.

Latt or in as the war developed grew two other problems in the solving of which the allied naves bore a
somewhat larger share though by in means ever as large
as that played by the British Navy. These were the
submar is meaner and the safe convoy of both troops
animals and munitions and especially of troops and
munitions across 3000 miles forceas from America.

How well the job was done every one known Just how it was done five know and less will tell. It is repthly held at the British Admirally that while perhaps little harm could be done by revealing all the story of the grantic tasks performed by the British ships it may well be the part of wadom to wait for a full revealation with the consulted traces in caller a feet and and the beautiful the story of the grantic tasks performed to consult the and and the beautiful the second could be story to the story of th

grants tasks performed by the British ships it may well be the part of wadom to wait for a full Perelation until the concluded passes is finally a fact and not a hope. There are however certain things which there is no longer any objection to spreading broadcast and these or some of them were laid before me to use for the benefit of the Scientific Augustians and its readers the ma ority of whom will unquestionably be interested in knowing just how big the Grand I leet is and what was its growth during the ways.

ourning ute was:

On August 3d 1914 the personnel of the British Navy
was 140 000 mm. Four years later the total man power
force was 400 000. These men began the war with a
displacement tennage segregating 2 500 000 tens and
after four years sailed in bottoms which segregated the
enormous amount of 0 500 000 displacement tons a figure
which it is simpost impossible to grasp. It includes of
course all the sunkings abjust and mail craft acquired
at the sunkings abjust and those such as for
the sunkings of t

But the building record has been without a parallel and perhaps nothing (unless it be the figures of accompishment other than battle results) can give a clearer itea of how single-mindedly Great Britain lived up to her n at often heard maxim. Win the war!



Battle-cruisers passing to their meerings after a wintry patrol

Since the beginning of the war Great Britam has completed eleven battleships, three battle-cruisers three cruisers 40 light cruisers, 300 destroyers 130 submarines 39 monators 60 pairel boats 600 motor boats and 300 mins remeals both aveopers and layers. At the start of the war sha persessed some four hundred vessels and when the armustice was sugged over five thousand flaw the Britash flag including some seventeen hundred travelers converted from a hundred peaceful sea pursuits to submarns hunters partel beats not guard vessels etc. It is one thing however to increase ships and personnel and quite another to have them function periodly in a short time. It is here according to the vision of officers high in the Britash Admiratly that tradition played a very vital role. As one of them phrased it 'Do you suppose that if occursoly had so the propose that if occursoly had so the propose that in Cornsoly had so the propose that the standard of the propose that the propose the propose that the propose the propose that the propose the propose that the propose the propose that the propose that the propose that the

Whatever the reason however the sudden expansion of alige and men by nearly three times was not accompanied by any diministion of dissipline or effectiveness as far as the results are concerned. Reference is not made here to the Jutland battle nor the anti-submarine campaign nor the sweeping of German radien from the sea but to the vitally important labors of transportation, accomplished in the face of the submarine mease with a percentage of loss most surprisingly small. All in all more than twenty-one million allied troops

All in all more than twenty-one million allied troops have been transported by so of these 4.39 have been clost at sea or 02 per cent of the total carried. To upport these me and gre them the wherewithal with which to fight 86.000.000 tons of stores for the Britan Naval and Milliary forces and 24.000.000 tons not asserted to the state of 110.000.000 tons not not considered to the state of 110.000.000 tons not not make the process of the state of 110.000.000 tons not considered to the state of 110.000.000 tons not make the process of the state of 110.000.000 tons not store for the state of 110.000 tons not store for the state of 110.000 tons not store for the state of 110.000 tons not store for the state of 110.0000 tons not store for the state of 110.000 tons not store for the state of 110.0000 tons not

by convoy
The convoys began in March 1917 when the necessity
to keep off the submarne rader was alarmingly apparent. Singe that date there have been 75 929 salings
convoyed with a loss of 417 ships or 024 per cent of the
asilings. To make this a little more read than day figures
succeeded in doing it may be mentioned that an 1917



The Grand Floot on patrol in the North Sea At times the line was sixty miles in length

Great Britain bought most of the Argan-tine wheat erop. But the Argantine as far away and there was no pray, not even "Luntanise" with women and children or hospital ships with wounded men which the German raider liked better than a wheat ship. England was to be strafed by slow starvation and the means were submarise hunters of food ships. Yet the British Navy did its work so well that of the 30° convoyed vessels whon aggregated 1408 000 duplacement tons carrying this wheat one vessel was lottle

1 400 000 curpiacement tons carrying this wheat one vessel was lost! Of course, not all convoy work was as successful Statistics are as yet somewhat unrelated and fragmentary because Great Britain has by no means gotten well started in the vast work of compilation started in the vast work or compilation necessary to publish complete statistics of the war and her part in it. But there are some facts available. For instance the British merchant steamships of more than ement to and from ports in the United Kingdom only, were most generally convoyed During the year from September, 1917 to the same month

from September, 1917 to the mann month its an average of almost 29 per cent of such ships were convoyed. Of these which were not onvoyed an average of 44 dep reent were lost. Of the convoyed vessels 70 per cent were lost 0f the convoyed vessels 70 per cent were lost before or after convoy while of those in the convoy an average of 58 per cent were lost. In other Sigures 220 ships convoyed, lost 5½ ships approximately, while 60 ships unconvoyed lost titnes and half ships approximately in the solution of the convoyed ship in the some of submanne monace was over centle times which it was to a convoyed ship with the British Nary on the job Navy on the job

There is a great deal of talk about the freedom of the seas and no one knows ust what it means We know the sea has been supthing but free during the period when Germany ran amuck and used her submannes without regard to law agreement or humanity. But what free-dom of the seas there was enough to put an American army in France which turned the scales and to maintain which turned the scales and to maintain food communications so that three nations could fight without starving what freedom of the seas there was came very largely because Great Britain had at the beginning the ships and the men and the ability and the will to build and trans-form others to equip and train the needed personnel and to use her mighty weapon with the bull dog tenacity, the quiet courage and the simple direct effectiveness always characteristic of the performance of her navy and her merchant marine

An Airplane with Wings of Metal

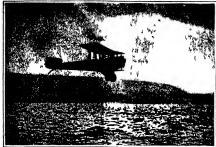
MORE than once it has been suggested that the arplane should follow a more substantial con struction. Why keep to delinate wood, guy wires and fabric? And always the answer has been that, weight for weight, the materials in general use cannot be

the materian in general use cannot pe improved upon

But the Germans have again gone into new glide and set saide all ongmeering prejudices. This time it is in the form of the Junker armoved machine which is the first real all-metal airplane

The Junker armored machine seems to have been designed for attacking trenches its fuselage m of the typical German design to fussings in of the typical German design and carries armor plate along its flat sides. The slightly curved top is of aluminum. The bottom of the body is formed of three flat surfaces, the middle one of which is horizontal, hot other two alongs so at to connect the edges of the horizontal bottom with those of the vertical sides. The engine, a 230 horse-power Bens, is also protected by armor pighting which is detachable so as to allow access to the eagine. The spracing is finished off just behind the gumer's pockpit, where it is constituted except the fussioning by a curved armor pists shaped to fours the gumer's body rest.

The wings, however, see of greatest sterest. The internal construction of the ings is in the form of duralumin tubes

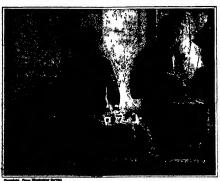


Land type British torpedoplane in the act of launching its 2 000-nound torpedo

crossing diagonally and connecting the tubular spars which latter are far greater in in ber than is ordinarily found in an airplane wing. In the Junker there may be said to be six spars if () nte the top 111 tt

tubes lying vertically above on another as one spar In section the planes of the Junker are enormously deep the maximum thickness of the top plane being about 16 inches The chord of this wing is a little over 8 feet. while the chord of the bottor plane is appr ximately 5

Junker armored airplane, whose wings are covered with thin corrugated aluminum



Wireless telephone apparatus which connect airships with ground stations

feet. The wings are covered with light corrugated shiminum shouts

From the fact that no trace was found of interplan strut fittings it would appear that these members have been dispensed with in the Junker The Junker is made in monoplane and biplane designs The one shown is probably the monoplane type

The Torpedoplane of Reality

EVIR since R ar Almiral Brailey A plane ba k in July 1912 this form of naval part of naval ner Bit it has remained fr the British and the Germans to give the tlet at a tial try it and this they did turing the last years of the great war. The tori diplane is n thing more than

an airplane or staj lanc arranged to carry one or more torped ses which it can launch at surface targets from a distance of a veral hundred yards to ensure accuracy of aim
The British have constructed torpedo planes in which a single torpedo is carried tween the floats or wheels depending on

whether the craft is a seaplane or land machines The Germans have constructed similar machines In some instances the torpedoplanes have had single engines while in others they have been of the

werful twin-engine model

British naval officers sank two ships during 1916 by means of torpedoplan The Germans rotalisted by sinking the British steamship Gena by means of one of their torpedoplanes However the war ended before either side could try out the tor; edoplane on an extensive scale hence the efficiency of this naval weapon is still a matter for conjecture It is under stood that a single torpedo weighing about 2 000 pounds is generally carried More torpedoes mean a larger machine which in turn means a botter mark for the enemy gunners Hence the single-torpedo type seems the best for the purpose

Wireless Telephony Between Airships and Ground Stations

TWO slender wires not exceeding 75 feet in length a cabinet no larger than the familiar household breadbox, but mounting various knobs instruments and bulbs on its front panel a square flat box mounting divers instruments not indicate on its top panel a diminutive motor generator set which could readily be carried about by a boy a collection of tiny dry cells embedded in wax so as to form compact units of many volts each—that in brief is the apparatus

which makes possible the carrying on of conversation between mirships and ground stations Such an in stallation was recently placed on the roof of the Equitable Building in New York city during a W S S celebration and the public was treated to a demonstration of wire-

less telephony between a large Navy dirigible and the station just mentioned

The Navy system of wireless telephony for airships is practically the same as that of the Army indeed the same as that of the Army indeed the same manu facturers a ipply their instruments to both services. I'we types of transmitters were employed in the New York demonstration. both of practically the same size design and general construction. The wireless waves in each case are generated by so called vacuum bulbs of the photron type three such bulbs being used with each set In one set two photrons are employed for generating the waves while the third is used in the modulating circuit which impresses the voice on the waves In the other set one photron is employed for generating the waves while two photrons are employed as modulators

The photo as are made in the form of electric lan ps with spiral filaments a cythin rical plut and a tiny grid 'the filament operates on a 12 volt storage battery A 22-volt dry battery is required in getting the builb to oscillate or produ waves This task is then taken over by a diminutive motor generator which converts low voltage current into 1 500-volt current for the grid of the

(Continued on page 104)

Battery Versus Magneto on the Airplane

A Sequel to "The True Story of the Liberty Motor"

THE further Germany's foes went in the war against Till further Germany's fore went in the war against lier the more ovidence they unearthed as to the thor sughaese of her ji sparation. I hit tale of industries thrown into confuse it is, the withdrawal of some German-made or German-motifed essential as a familiar one. In the manufacture of the internal combustion enguse the strategic point held by the fum lay in the gigntion system a condition had been reasted unded which magnetos—especially magnetos suitable for aviation— were so largely made in (ermany that the opening of

thought the left the Allis in a serious predicament.

Toward meeting this situation America made a material contribution. This was made possible partly by our vigorous motor truck divelopment which had kept our magneto industry in good shape but above all by a new typ of American magneto just coming into its own at this critical period. The rotary pole magneto, described in our issue of January 11th, had not reached its present estate in 1914 but it existed and gave survice. One of the steps that the Allies took to meet their emergency was the placing in this country of orders for this magneto First and last, hundreds of thousands were shipped and their part in Allied control of the air

anything but small

Another measure which the Allied engineers must have considered was the alternative of battery ignition. But the opinion prevailed until the appearance of the Liberty Motor that a battery was out of place on a The I berty however, is a success and this it could not be if its ignition were an absolute 'bust Its performance accordingly means something to the ignition engineer, but what? It might mean that the battery is to supplant the magneto it might mean that the two are to be on an equal footing it might mean that the battery is a sufficient emergency substitute for a magneto it might mean that a man who is determin to run a p ane on battery ignition can get away with it. The only way to decide just what it does mean is by a general hearing of the case of battery vs magneto

The battery system consists of two fundamental parts -battery and generator the rest of the outfit is the mechanism of timing distribution and control bines the magneto itself is a generator without a battery, the obvious question is Why the battery. We may let its advocates speak first and tell us the reason, as

Concerning Safety Factors

A plane differs from a truck or a car, the pilot can't get out and tinker with his machine can t draw to one side and await expert aid—he must complete his day a work without irregularity of operation, or not at all And if irregularity comes if puts him in peril where on the ground it morely constitutes an inconvenience. So we must give the aviator every factor of safety in terms of ignition, this involves two means of creating the vital spark. Then if one staff fails he can lean on the vital spark the other

The battery advocate says he has met this requirement Into battery advocate says no mas met this requirement. He says that if the battery fails the generator goes on firing, and if the generator fails the battery goes on firing 80 he daims he has provided two separate sources of current. The magneto man can do as much only by mounting two magnetos and this gives the battery a

big advantage in weight e magnete mun disputes all this. He is not satisfied that the generator will go on indefinitely with the battery out of commission. In the absence of the regulator run from the battery and from the battery alone he wants to know what is to prevent the generator from going up and up and up until it burns out But he will not press this point for he has a more serious one which the battery man admits. With the battery out the generator at best will fire only so long as the engine runs continuously after it once stops the gonerator can never start it. We shall return to this On the other hand even the battery man can't claim

that the battery will go on indefinitely after the generator fails His best argument here is that the battery will fire for three hours. It will last for three hours because its capacity is nine ampere-hous and the ignition but the asgreto man save current is three amneres current is surce amperes. But the agencie man says that it will obviously go down below sparking voltage before the three hours are up. But the existence of a period for the battery, rather than its exact length is the critical point. The magneto man wants to know whether the pilot is supposed to go on with his work for that period, relying upon the single source of spark which is definitely going to quit without warning or whether he is supposed to drop all business and rush for home the minute his generator goes out Either alternative seems an embarrassing one

The Parable of the Sock

A certain laborer banked half his week a carnings in an old sock, and at the end of the month paid the rent out of the sock. He argued that he had thus two sources of funds if he lost the sock he still had hu job, while if he lost the to the sock he still had hu job, while if he lost the pob he had the sock. One day he did lose hus job, whereupon he discovered that he could get out of the sock exactly what he had put into it from his pay. envelope, and not a cent mor

The magneto man says that the battery booster is in just this position. He says that the battery charsed just this position. He says that the battery charged from the generator, is not a source of current at all, like the sock, it is depository, from which we can get back only what we have sailed down in If it be suggested that the battery is a source to the extent of its initial charge, the magneto man will point out that to offset this initial sum in the sock, there is a hole in the latter through which 30 pcr cuit of all the electrical the latter through which 30 per cent of all the electrical funds deposited in it leak away. He will close out this side of the case by asserting that if the battery man wants two independent sources of current either of which will spark indefinitely after the other quits and neither of which is in any way affected by the quitting of the other—if he wants to compete with the magneto, in other words—he must mount an entire duplicate outfit—battery, generator, and all Then he loses his

outil—battery, generator, and as besseted advantage in weight. The magneto man now brang forward has claim of positive advantage, which is, a better spark. The magneto spark increases in intensity with the speed of the motor, but otherwise as remarkably constants. The battery spark is admitted to fall off in intensity at high battery spark is admitted to fall off in intensity at high spark of the distribution, the magneto make rays it is variable and the addition, the magneto make rays it is variable and the addition, the magneto make rays it is variable and the spark of the distribution of the spark of the s battery spark is admitted to fall off in intensity at high speed, in addition, the magneto maker says it avanable on its own grounds, going down, now and again, to a point that implies a massed applosion. This indictiment the battery man of course indeparantly denses. The magneto man search stath its battery oscillographs were made from a stook Laberty ignition set, under field conditions, and he says that the oan gat a variable spark out of the battery by fair means, the aviator can de so, to So much for noutive arruptment, what of negatives

out of the battery by far means, the aviator can do so, too 80 much for postive arguments, what of negative ones? When the battery man is asked to critiques the magneto, he says it has too many moving parts. The magneto man agrees; but he challenges the bettery to make a better showing. If the battery could be installed without the generator, it would constitute an improvement inder this count, but on an aurisane it amprovement under unis count, but on an airplane it can to so it fails to make good its own point. Before the invention of the rotary pole, it might have been argued that the magneto was limited to eight cylinders and that the battery therefore had an advantage in flexibility. this can no longer be admitted

"Trouble, Trouble, Nothing but Trouble!"

When we ask the magnete man to stop boosting his when we ask the magneto man to stop boosung ms outht and to knock the battery system he replies that the latter convicts itself. In the army training school at the magneto factory, the bulk of the lectures and the bulk of the hierature placed in the student's hands is devoted to explaining to him the construction and the operating principles of the magneto. In the battery school the matter is quite otherwise, a preponderance of the work of his co arse here is given over to making of the work of his course here is given over to making him acquainted with the 57 varieties of trouble he may expect to meet, and the ways for avoiding and over-coming them. In at least one instance, he is told Don't touch it, send for an expert!

The magneto man figures that this state of affairs is natural enough The battery system comprises a generator and a battery and a couple of distributors and a regulator and an ammeter He says that acand a regulator and a numeter its says that ac-cordingly it may be expected to display all the weak-nesses found in any of these units, together with the special weaknesses inherent in a complicated electro-mechanical system composed of numerous elements of diverse structure and operation claborately intercon-

I thus the bastery consusts of a vessel containing figuid, which must remain instead which travelling on a phase which must remain on a phase some passes of the passes about it must have been passed. Before it goes about it must have been passed before its goes about it must have been passed on just the right speeding parvilly by a procedure which the magneto man refuses to believe in possible outside table laboratory. After it goes about it must be kept from sulfating. Fully charged, there is no prospect of its freeding, but laid discharged, it freesses between 8° and freeding, but laid discharged, it freesses between 8° and 30° below sero, Fahrenheit

The magneto man lays stress upon the number of wires and connections in the battery system. He points out that a battery expert has to be an expert in half a dosen lines. He considers that the great number of places is which to look for trouble makes it a master of more time to put the battery system in order and keep it so he passes to his climax

The magneto-operated plane is sta ted by an independent, hand-operated magneto. Whenever compression exists in a single cylinder that little coffee-mill after with starts the engine. The battery-oquipped plane after will start the engine. The battery-oquipped plane in the starts of the start will start the engine. The battery-oquipped plane in the start that the generator will first the engine as long as the engine runs continuously. But the minute the engine stops, the generator without the batte y will never start it again, under any terms whatever. This is what our battery friend was getting at when he stated, conservatively enough, that "the engine will continue to run indefinitely until stopped, when difficulty will result in starting." (The itsides are ours.)

When this meahne comes down, the pitch is expected to throw off his ignition switch. But being human, sooner or later he us going to forget this. The battery

sooner or later he is going to forget this. The battery will then go on discharging until it is as dead as Julius Caesar, and that plane will stay right there until it Caesar, and that plane will stay right there until to gets a fresh battery II this happens at home, it is merely an inconvenience though perhaps far from a minor one But when the battery and the engine die at the same time over hostile territory, add one plane d one aviator to the list of missing in action aviator flying on his generator alone, with his battery out of commission knows with complete certainty that

out of commission knows with complete certainty that anything that stops his engine stops his plane for good 80 much for the case of battery vs magneto in aerial work. We say nothing for or against the use of the battery elsewhere But items which on the ground naturely essewhere But items which on the ground constitute merily offsets to the advantages—mostly of sconomy—gained by using a battery, become, in the magneto man's mind, conclusive arguments against that the use of the battery in the air. For planes, be insiste that the precedent laid down in favor of the magneto is a just one

is a just one
Prior to the appearance of the Liberty, no ranking
plates had ever mounted battery upition, all records
are held by magneto-equipped planes, right down to the
altitude record made in the home of the battery, the
other day, by a Hippano-Suna plane, with rotary-pole
magneto Why, then, is the battery ignition found on
that theserves. the Liberty?

What About the Liberty?

The designers of this engine have rpoken in these columns. The True Story of the Liberty Motor, which appeared in our issue of June 1st last, was compiled after close contact with the mon responsible for the entire development. We quoted these men to the effect that, while the original commercial plans called for battery ignition they had shared the general opinion for battery ignition they had shared the general opinion with regard to the desirability of the magneto, and had made every effort to use it, that it had failed, and that when, in this dilemma, they turned to the battery, it had done (the job. The first indictment brought to justify this action is that, in the Liberty tests, "
possibly to the vibration of the engine at high aper magnets of the magneto showed fatigue, and gradually lost their magnetic property"

makers were not content with directing attention to the discrepancy between this and the classes that 'tests of the sagms showed that there was no noticeable volvation with the cylinders set at this numeral angle. They didn't believe that any amount of ribration would knock the purce out of their magnets, and to prove it, they installed a stock rotary-pole magnets. to prove it, they matalled a stock rotary-pole magnete on a Hispan-chiuse sight, and ran it continuously for 55 hours. The engineer of thus test any that he didn't make that test on a Liberty because he had then no stock magnete that would fire the Liberty, but that if the make that would fire the Liberty, but that if the fired that would fire the Liberty, but that if the magnete that would fire the Liberty in the end of the run the magnets were found to have less that of the liberty designent are repaired to the liberty designent are right in their allapstime it constitutes a slap, not at the magneto, but rather at the engine that rathles to self me access.

When the Liberty experimental work was being done. (Continued on year 104)

Correspondence

The adition are not responsible for statements made the correspondence column Acceymous commuat be considered, but the names of cormondants will be withheld when so desired

The German Losses at Jutland

To the Editor of the Scientific American

There are a number of interesting naval items more
or less clouded in mystery that I have been looking to of item counted in mystory than a series does not not any your columns to clear up since the surrender of part of the German fleet and the admission of German defeat at Jutland by the German navel officer, Captain Persus The latter's confession bears out Admiral Jellicoe a report The latter's confession bears out Admiral Jollicos a report of the battle concerning heavy Garman losses that could not be positively confirmed at the time ewing to the mist, smoke and dashness But with the most powerful part of the Garman Navy in a British harbor and a British aguadors guarding the balance at Kirel and Wilhelmshawes, the identity of the "severe losses" of the High Seas Fleet still remains unknown. We were led to believe that those losses in capital shape in addition to the lives that these losses in capital shape in addition to the still the still remains unknown. We were led to believe that these losses in capital shape in addition to the battle-cruiser, supposed to be the "You der Tann," and the dead of the still remains unknown that the dead of the still remains and not a new "crasts" surrendered the other day along with four other battle-cruisers. There remains the and not a new creace surrounded the Greek way along with four other battle-crusser. There remains the probability that the battle-cruser "seen to sink" was the Greek "Salamis" building in Germany in 1914 and the Greek "Salamia" building in Germany in 1914 and taken over "Be is approximately of the same ionnages as the "You der Tann" and probably similar in appear-ance and the Germans took advantage of the uncertainty surrounding her, in concealing her loss by stating that only five battle-crussers took part in the fight and then in answer to detains of the British as to battle-crusser losses, snawer to claims of the British as to battle-cruss! losses, by proving the crustence of all but the "Lutsow" which loss thay subsequently admitted, (e., Sedditt," Moltke," "Borfunger" and "Von der Tann." The Britash believed that the "Hindenburg took part also, but this would brung the German battle-crusser strength to seven, while the British only reported a total of ax Thewfore, if the "Hindenburg" was completed in time to take part in the fight, which I doubt (and this ought to be easy to ascertain now), then the "Stalanis," or whatever German name she bore—did not, but if abd dot she would undoubtedly have been surrendered on November 21st as the British demanded all the German battle-cruisers. It seems that probably he was the vassel sunk in action, but the world awaste confirmation Nove no accurate account of the Battle of Jutland can

vessel suck in action, but the world awaite confirmation.

Now no accurate account of the Battle of Juthand can
be written until these matters are cleared up and when
we come to German dreadnought losses, there is further
confusion.

It is known that all the German ships of this confusion. It is known that all the German ships of this class that were completed at the time, 17, were in the fight, i.e., four "Koenigs five "Kaners' four 'Olden burgs' and four 'Nassaus'. The British claim the destruction of two But all five 'Kaners' and three of the four 'Koenigs' surrendered, and the other 'Koenigs' was interned at Kiel, not being in condition to put to see (all of them the original ships and not "ersatt"). Therefore, the loss must have been sustained by the other squadron of cight 'Nassaus' and "Oldenburgs. The press dispatches coming from Germany at various times the content of the custement of the custemer of the custeme press dispatches coming from Germany at various times together with photographs have ductosed the existence of most if not all of these eight vessels, the most recent dispatches grups accounts of the revolutionary movement among the sailors mentioning a number of them by mane. It has also been stated that their surrounder was not demanded, because it was known that their arms ment had been removed to the Western Front and much continued to the sailors of the sailors together with photographs have disclosed the existence

se, but to a layman at least unless definite statements of proof of German losses in capital ships other than the old Pommern the 'Lutsow' and (gwing Britam the benefit of the doubt) the balamm's are forthcoming, credit must be given in all fairness to the much desposed Light Seas Fleet ao ignobly given up for balancing the above loss (together with four light cruisers, nine destroyers and one U-locat) against the destruction of three British battle-cruisers. three old the contract of the British battle-cruisers three old the battle-cruisers three old the contract in the destruction of the British battle-cruisers three old the state of the British battle-cruisers three old the state of the British battle-cruisers three old the state of the British battle-cruisers three old three british battle-cruisers and the British battle-cruisers are also better the British battle-cruisers three old three british battle-cruisers t (giving Britain the benefit of the doubt) the

[We have already stated in these columns that in the beence of an official report or the subject the statement made by the Germans after the Jutland battle would seem to be correct, so far as their losses are concerned Captain is seems to imply that it e losses were greater, and he ought to know The point is well taken regarding the "Salamie" The "Audacio is was mined early in the war and sank She is reported to have been raised, but toe doubt at -Enrron l

A Wanton Waste

To the Editor of the SCIENTIFIC AMERICAN According to the daily pipers of December 14th a collection of 2,625 dangerous weapons taken from criminals and others during 1018 and valued at \$30 000 was thrown into the occan by the New York police department. The item caught my eye rather forcibly and I thought it ought to be brought to your attention in your capacity as moulders of public opinion In these days of high pressure conservation it seems almost incredible that any state officials should be guilty of throwing away \$30,000 worth of material, which according to the clipping, did not contain any explosives other such dangerous substance. It is obvious that the stock of the pistois, revolvers etc. must have been of high quality metal which could easily be reclaimed and put to more logitimate usc.

Concrete Roads for Heavy Traffic To the Editor of the SCIENTIFIC AMERICAN

Some Motor Truck I conomics "Some Motor Truck I conomics appearing in the Scientific American for December 28th 1918 well Scientific American for December 28th 1918 well describes the madequacy of our present highway system for motor truck traffic. The failure of our roads under this new means of transport has been very general. Yet there are exceptions to this general unpreparedness of our highways which should not be forgotten—exceptions which are due to the foresight and energy of progressive communities

Notable among these are the extensive concrete road systems of Wayne County Mich Milwaukee County Wis, Huron County, Ohio Maron County Ind and Vermilion County, Ill. In all of these counts, concrete roads have stood up under in it rims, that limiting whether it be trains of government trucks supplies for manu facturers, loads of coal, farm produce or miscellaneous

The statement, "When yer the big army trucks have The statement, "Wherever it is big army trucks have run constantly, there have r ads gine to pieces is true in most cases, but not when it require was over will constructed, hard surface it yet mints. From Detroit, long government truck trains have left for the coast over Wayne County roads and the reads have been fully adequate Local motor car traffic over Wayne. County a 150 miles of concrete roads is an irm us and by 1u v 1st 1918, there had been licensed 9 988 motor truck and commercial vehicles and 57 633 pressing r carp. 1-affic on Woodward Avenue on June 10th 1917 in might less than 14 hours amounted to 11 000 motor driven vel cles

than 14 hours amounted to 11 000 motor driven vel cless Similar, though perhaps its of that frailip assess over the other concrete systems so that while ac quartarrough routes are yet to be constructed a number of communities are already prepared for the motor truck

Finger Print Classification

To the Editor of the SCIENTIFIC AMERICAN

To those persons, who for any reason, find it trouble-some to use the old or improved Henry System of Finger Print Identification I suggest the use of the Hollman Notation as adapted to all purposes and being

Holiman rutasens as maps of the control of the Holiman Nutation each ascepted specific style of Registry print is pormanently assigned a numeral as follows Whorls (1) ulnars (loops) (2), central

pocket loops (3), radials (loops) (4), lateral pocket loops (5), tented arches (6), twinned loops (7) arches (8), accidentals (9) The cipher (0) is used wherever a finger or fingers are missing or has the finger print ridges permanently mutilisated otherwise the dash () is used until superseded

It will be noticed that the even numerals are assigned to loops-arches and the odd numerals to the whorlscomposites In making an index number or fraction there are five places which give a number in the tens of thousands the left-hand or highest place being assigned to the thumb, next (to the right) the first finger and so on to the units place which is assigned to the fourth or little finger. The right hand is the denominator of the filing fraction—the left hand is the numerator

Thus the Henry Classification 1 sA 13 would read

42 222 13 in the Hollman Notation. The first two numerals of each number are the style of each thumb and index finger respectively then the second third and fourth fingers 13 is the number of ridges in the loop of the right fourth finger

The Hollman Notation is self-indexing and interpret-

Into Hollman recurring and in serpresenting and its scope seems to be unlimited. Determination of styles (types) is in accordance with the principles laid down in The Finger Print Instructor by Frederick Kuhne (Munn & Co., 1916)

F H ROBINSON Brooklyn, N Y

An Open Letter from the Secretary of Labor

To the Business Men of the United States

Every public discussion shows how sincerely and eagerly the business men of the country are seeking a labor policy that will enable them to take advantage of the many commercial opportunities awaiting them Business men are coming to recognise generally that efficiency in production and consideration of the interests of workers are meeparable

It is natural that these men turn to the Government for leadership in dealing with a problem that is national in scope and interest. The tendency of government is toward closer relations with industry. The research work to secure the data and determine the standards as the bash of business organization can best be performed by a disinterested governmental agency, able to gather the experiences of all and to reach conclusions based upon

The Department of Agriculture, the Department of Commerce, the Department of Interior, have constantly been developing more practical service to the interests they serve I here is an analogous service the Depart ment of Labor can perform Just as the Bureau of Foreign and Domestic Commerce furnishes information esources transportation and trade of foreign coun tnes the Bureau of Mines advises mine operators on technical problems safety and sanitation standards the Department of Agriculture furnishes farmers the scientific rmation necessary to successful production and sale of farm products there is a scientific field in which the Department of Labor can serve as consulting expert to employers and employes in industrial production field includes sanitary and safety standards, the administration of measures necessary to prevent physical dis abilities and the relations between managers and em

ployes known as simployment problems

This service is distinct from that performed by the Mediation and Conclusion branch which deals with working conditions and industrial itlations as contro issues between employers and employes Antici variant issues overed chiphytris and employes. Anticipating the intrasing importance of establishing working conditions on a secutific basis the Dipartment of Labor created the Worling Conditions Service. The work of the Service is conducted through three to work of the extree is conducted through three to ordinated divisions. Division of Industrial Hygienic and Medicine Division of Indoor Administration and Division of Safety Engineering.

The Division of Industrial Hygieni

develop standards of samtation and medical practice in industries I he personnel of this Division is detailed from the United States Public Health Service

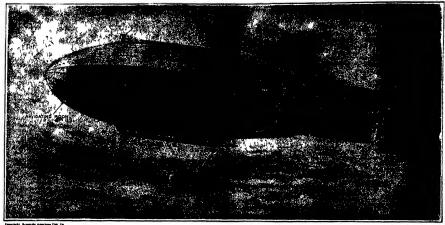
The Division of Labor Administration will advise employers as to employment as stems and labor management policies, and assist in putting into operation stand

their portion, and phrising and phrisis and policies.

The Division of bafety I agencering will develop standards and practices for accident prevention, and advise employers as to safety methods best adapted to

The Department of Labor offers business practical service at a time when its need is manifest assistance is available to owners and managers of indus trial establishments in working out labor policies and

W B WILSON Secretary of Labor



Our artist a conception of the passenger-carrying dirigible of the near future, making use of hollum gas

Airship Versus Airplane

Salient Features of the Two Types of Aircraft With Regard to Their Applicability to Passenger Transport By Ladislas d'Orey, M.S.A.E.

Now that the quantity production of non-inflammable lifting gashelium-has eliminated the most serious defect of airships i c the truly disproportionate fire risk their method of sustensition involved there cannot be the slightest doubt but that the major if not all problems of aerial transport will in the near future be solved by the airship, and not by the airplane

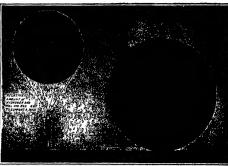
Such a statement is likely to rouse the ire of airplane manufacturers, it is never-theless based on irrefutable facts, as will be seen bereafter

Taking into consideration only essential factors the respective merits and defects of the airship and the airplane for commercial purposes may be reduced to the following terms

In the airship sustentation is achieved by means distinct from propulsion whoreas in the airplant forward motion generated by the propelling at paratus is the necessary condition of lift Threfore while an airship can stay about regardless contents of the propelling and the propelling and the propelling areas and about the propelling and the propelling areas are also as the propelling and the propelling and the propelling as the propelling and the propelling as the propelling and the propelling as the propelling of engine stoppage (accidental or voluntary) a failure of the airplane s power plant necessitates an immediate

power plant necessitates an immediate descent in gliding flight. This feature furnishes one of the most serious objections to the use of most serious objections to the use of the airplane as a passonger carrier for a forced landing is not very pleasant to visualize when occurring on vast stretches of wooded or mountainous country or the Northern Atlantic in rud winter for example In this connection it is interesting to recall that in a paper read last year before the Royal Aeronautical Society the suggestion was made to establish along future lanes of serial transport a chain of landing grounds not r than ten miles apart so sirpisnes in distress may always find level areas within the range of their gliding angle That such a scheme, entailing as

[N last week's issue of the Scientific American we announced that helium could now be produced on a commercial scale cheaply enough and in sufficient quantity to replace hydrogen in balloons and airships Because helium is a non combustible gas its use will result in material changes in the design of dirigibles The engines can actually be placed inside the shell of the balloon bringing the propellers on the axis of head resistance and this resistence can be cut down materially by preserving a perfect stream-line design, unbroken by suspended cars and a tangle of stays A possible helium airship of the future is illustrated herewith We also show by illustration the lift of helium as compared with hydrogen and the present cost of helium as compared with its cost before the war A new future has been opened to the airship and its advantages as compared with those of the airplans are here discussed -EDITOR



Lift of helium and hydrogen compared, also cost of helium now and before the war

may well be inquired an enormous penditure should have been seriously sug gested by an enthusiastic advocate of com cial aviation who is by the way one of mercial aviation who is by the way one of the largest British arplane manufacturers, is highly significant because it emphasizes the fundamental defect of all hasvier than-air craft that is, the insufficient security afforded by dynamic sustentiation. It is true that load-carrying sirphanes have been developed during the war in which the risk of a forced landing is some what reduced because the motive averageting.

what reduced because the motive apparatus what reduced because the motive apparatus is split up into several power units. But even so the risk is only lessened and not eliminated, for it is materially impossible that a twin-engined airplane for instance carry when flying on one engine more than one-half its indicated full load—unless, of

ocourse, the machine is so designed as to carry its full load on one engine, with another engine kept idle for emer-gencies The latter solution—quite regardless of mechanical difficulties regardless of medianical difficulties is conductive to such a waste of carry-ing capacity that it cannot be seriously entertained for a moment

It has been variously suggested that could the airplane be fitted with lifting screws whereby it would be able to hover like an airship, the able to hover like an aurhip, the principal objection, on grounds of insufficient security, to its uses as a passenger carrier would be eliminated. This is however a fallacy because— without discussing the feasibility of such a scheme—the lifting screws would just like the propellers, be subject to stoppage through engine trouble Now it may be argued that acronautic engines will eventually atacronautic engines will eventually at-tain a degree of reliability that will virtually eliminate the risk of a forced landing While this assumption seems justified there is nevertheless one specific case in which even engine reliability cannot prevail against the inherent defect of the airplane; mely its mability to hover This case is the necessary

which will constitute perhaps the most serious problem affecting the successful operation of commercial flying services serrous processing flying services if a log bank covers the servicine, and incoming simplane will have to fly round and round until the fog clears away—or the fuel supply gives out, under the same circumstances an airship will stop its engines and hover until a landing can

sately be exected.

The superiority of the airship over the airplane in affording security to passengers under the most difficult operating conditions is thing manifest. A Zeppelin-type airship, in which floatation is secured by 20, red by 20, or more, separate gas-bags is fully com-parable as to safety to a steamer fitted with watertight compartments. Just as a steamer may spring a loak and have several watertight compartments flooded without sinking, so can a Zeppelin mainwithout sinking, so can a Zeppelin main-tain its buoyanoy even if several of its gas-bags, shenid he pierced Injury of this sort may by the way be mended in flight, because balloon fabrics can be patched like automobile trues, it follows that ariships of the rigid type have little tear of accident on this score. On the other hand it is true that atmos-

heric conditions (sudden variations of temperature, a pheete conditions (success variations of temperature, a heavy rainfall, sowetorms, etc) may cause a consider-able reduction in the lift of arriving, this feature may appear as a drawback of lighter-than-are craft, but need not cause real concern provided supply tanks, for re-charging the garb-caps in the sir, and a sufficient amount of ballast are curried on board

Raliability

Security in operation is, as has been seen, mainly a matter of sustantation reliability is one of propulsion Nation to safety, ability to reach within a reasonable time limit the place of destination is the most important requirement that must be demanded of commercial air-

Thus defined, reliability in operation depends (1) pon the trustworthiness of the propelling apparatus, ad (2) upon the maximum speed the arrship is capable

and (2) upon the maximum specu use arising a uniform of developing. Now, eague reliability can be achieved more easily Now, eague reliability can be achieved more easily on airships than on airplanes because on the former the great buoyancy permit the use of comparatively heavy engines, these may furthermore be throttled down for long stretches—when flying before the wand, for instance which reliabes them of considerable strain whereas on airplanes the engines have to be run most of the time at full nower. Another bout in favor of the arribip is at full power Another point in favor of the airship is that, owing to its independent sustentation, minor engine

tant, owing to its inapopenent sustentation, minor engine repairs can be effected in flight properties of the second section of the second section in the Jave been made by airplanes, whereas airships have not exceeded 75 m p h, from which the conclusion

may be drawn that airplane are much more independent of adverse winds than air-ships While this is true to some extent, it should be noted that the surplanes endowed with the highest speed are single, or two-seater machines carrying a useful load of but a few hundred pounds, whereas great load-carriers, such as the Handley-Page for instance, do not exceed as a rule 90 m p h The superi-ority of the commercially usable airplane over the airship is therefore not so very marked with regard to speed Furthermore, the Zeppelin Furthermore, the Zeppelin, which is the fastest type of airship in existence does not embody the hull shape most favorable to high speeds, because it was designed for quantity production, it may be assumed, that by adopting a finer streamline hull the speed sould be bettered some ten miles per hour.

Bemoving the sandbags, boards and other protection from the Vendome Column in Paris

take oruses with beavy eargics which entirely outstrp in importance anything large airplance have so far achieved A Expision of the 1917 model (60 gross lift tons, 1,200 h p, 70 m p h) could actually cross the Atlantic, earrying 100 passes agrees as h 50 pounds of baggage each and a crew of 90 at a mean speed of 50 m h, which comes to assume that the trift from Irribard Alianus, control of the control of t mail service as soon as peace as signed. These arrahips are to have a gross lift of 115 tons and a total horse-power of 2,400, they will carr; 30 tons of the provisions, etc., 45 tons of earge and mails and 100 passengers that is, the useful load will exceed 80 tons.

These figures would seem fantastic were it not a well

known fact that in airships the loading efficiency that is known fact that in ariships the loading efficiency that is the ratio of useful to grees that greatly increases with an increase in size when as in arplanes it runuins at best constant. The reason for this is that the lift of an airship increases as the volume or the rule of the an airship increases as the volume or the rule of the an airship increases as the volume or the rule of the an airship increases as the volume of the rule of the an airship increases only as the sequence, the sequence of the rule of the anti-rule of the rule of the rule of the rule of the rule of the increase on both craft in a recording to the superficient of the increase of the rule of the increase of the rule of the

hand the weight of the structure increases on both craft in proportion to the superfici area on the at such exceed. Thus, the bashing efficiency does not a stude exceed and the such as t

a craft would possess in rapid, long

In a discussion of the merits of success in a discussion of the inerts of aircraft or committeed purposes the question of confort afterded to travellers as by means negligible quite regardless of all speed in five this 11 machine in question may be 11 fert. Indeed if the air ship or the airs on a become an scorpted means of travel comparable to steamships railways etc. then the acrual aveler must be arsured of finding reason able comfort on board surcraft

(Continued on page 104)

Uncovering Paris Monuments Now That Air Raids Are Over

WITH the danger of air raids and Whili the danger of air rands and bombardment now past Paris is again displaying her art works to her appreciative visitors. Already, many of the carefully protected public monuments have been uncovered and restored to their peacetime appearance Typical of this activity is the accompanying view which

shows a group of workmen engaged in removing the sandbags cement walls and boards from the stately Vendome Column

S A. T. C. Salvage

WITH demobilization of the Army and Navy Units of the Students Army Training Corps at Stevens VY of the Students Army Training Corps at Stevens. Institute of Technology at 10boken completed there are left nearly 500 men who will go on with the regular mechanical engineering course, only about 70 having withdrawn. Ihis is regarded as an exceptional record and leaves the total college attendance close to the highest record of previous years which was 520. Even this may be surpassed by the return of men who left the course to volunteer in the early days of the war. A number of these men have a Iready applied for reinstate-

Disastrous Explosion of a Tank of Molasses

WHAT is there in molasses that would make it WHAT is there in moissees that would make it exholed particularly in winter time when the sticky syrup is proverbially alow? Two weeks ago a large tank of moissees exploded in Boston killing a dozen persons and injuring 50 more and no completely satisfactory explanation of the disaster is obtainable

astafactory explanation of the disaster is obtainable. The tank was a luge cylindrical siructure with a capacity of two million gallons. Without an instant a capacity of two million gallons. Without an instant a work burst agant. A city bulling nearby, where the employees were at lunch collapsed burying a number of victims and a fire house was crushed in by a section of the tank, killing and mjuring a number of the fremene. Wreckage was seathered in all directions while

a deluge of molasses spread over the runs and mto street, suffocating many of the injured and increasing the difficulty of rescue

The only plausible explanation of this unique disaster is based on the assumption that there was an accumulation of alcohol in the tank In order to have the molasses fluid enough to flow readily through pipes steam-heating or ils were placed in the tank and it is quite possible that there WAR somo fermentation generating a certain amount of alcohol It may be that the steam was left on too long warming the melasses sufficiently to vaporize the alcohol and this, mixing with the air at the top of the tank, resulted in the accumulation of an explosive mixture which needed but a spark to touch needed but a spara to tourn it off Possibly an attendant lowered a lantern into the tank or dropped a lighted match into it to determine how much molasses it con tamed and then-the accompanying photograph tells the rest





A group of Boy Scents that made goed on the slogan, "Every Scent to feed a soldier"

Harnessing Boy-Power

The Story of the Boy Scouts-What They Are and What They Have Done By William B. Ashley

WHAT is boy-power?
Boy-power is exuberant boy energy After the normal scalawag lots loose a requisite amount of energy on study, eats, sleeps, and trying to behave he has a whole lot of energy left over

This exuberant energy is employed by the average boy in a number of ways. He uses it to generate loud yells at sudden intervals, to move his arms and legs in games like baseball and football tag, and athletics generally, it makes catapults of his arms when snow is abundant and motors of his legs when skating is in vogue It helps him roll cigarettes kick a tin can along the sidewalk, fight, ring doorbells, run to fires, stone cats and dogs And it sometimes is employed in shoveling the snow off of sidewalks, cutting wood, pushing a lawn mower around, spading a garden, running errands, and even

around, spading a garden, running (rrands, and even holding down a job after shoot hours Lxptrts state that the average boy is awake approximately 5.500 hours in the year Taking the year through 900 of these hours are spect inside the school room, 1,500 inside his hours, and 100 inside church and bundly whood libres thou church and bundly whood libres thou spect outdoors working off his coubrant therety. Then are exceptions, and the war has somewhat changed the general conditions but this malviss of a boy's conditions but this analysis of a boy s time is accurate enough for the purpose in hand

What is the product of the use that the boy puts his exulterant energy to, the d,000 hours in a year? As there are around 8,000 000 boys in the United Stated whose ages run from 12 to 18 this question is

important
In a large degree it is muscle health can be included a good constitu-tion for the years shead. These are valuable assets. But suppose this extion for the years aneso loss are valuable assets But suppose this ex-uberant energy, this boy-power, can be harnessed so that it will produce other benefits to the boy himself and very specific benefits to the community and the state without robbing the boy of muscle or health, or of any of the worth-while fun he has while directing the use of his own exuberant energy? Suppose also that in this process the boy who formerly would have arrived at the threshold of business life 15 per cent prepared (let us

say), should by this process arrive there 55 per cent pre-pared 20 per cent more efficient at the very start of his business life

his bunnes life
Hartford, Conn, was to have its annual elean-up
The Chamber of Commerce called upon the 350 Boy
Srouts of the city to assets At une in the morning
they got into action. They distributed \$4,000 circulars
to householders, enspected 1,522 front and backyards,
reported 2,073 bad conditions, completing the task
in 3½ hours in commercialing the throughness of
their work, the Secretary of the Chamber of Commerce
worte "Who beades the Boy Srouts could have done
the indispensable work these loyal boys dai? The Boy
Srout Movement, as an efform and ideal nethod of
harnesum boy-power, is the subject of this strated
The catalog above included "urnuning to fires" From
time immemorial the boy has been an infernal nuisance

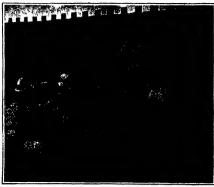
to the firemen. But in various localities Boy Scouts are being organized as fire patrols. They have a system of quiet mobilisation. Special automobiles carry them with their equipment of fire rakes, axes, water bags, and so forth, to any point where they may be needed. The law gives them the right to commandeer plows, teams, and most between the ages of eighteen and fifty-five years. The scouts are authorized to tear down fearors, settle lands, cut trees or do anything reasonable in the discharge of their fire duties. This is an examples of how becomes from the boy a. boy-power formerly employed in making the boy a nussance, harnessed, can make him an asset to himself

How did this idea of organising boys for civic service come about?

The germ of it is found in the daily good turn, which every Boy Scout is expected to do for someone without

Boy Scout is expected to do for someone without no form in a practical expression of the ability of a boy to do things for himself "and others" One great object of the Boy Scout Movement is to help boys develop ability to do things for themselves and others

evelop shills to do things for themselves and others. The good turn is either spontaneous, or the result of deliberate search for an opportunity It must be practical It oan be an individual act, or performed by a group of secute 1 for example, a number of secute on a car one night discovered as an old lady who had lost her "bearings" (the secure of the control of



Some more Scout work that looks toward improved food supply

SCIENTIFIC AMERICAN

established public drinking pinces, a grack larger number where they are esponsible for the rausing and lowering of the flag on public buildings, and a still larger number in which secuts are resible for adding to the attractives of their home esties.

Perhaps this process might better have been called "storing up boy-power" A boy's muscle grows by the use of it, and his ability to do things increases by precision It's the play spirit, the team-work spirit, the idea of doing something out of the ordinary, that keeps the Boy ordinary, that keeps the Boy And all the time he is storing

work apits, the idea of doing something out of the ordinary, that keeps the Boy Soout at it. And all the time he is atomig up within himself a big reservor of power that will make him an invaluable clusten when he comes of sever Lot a see how this women couples the estimate and the comparison occupies the estimate the comparison of th Typical civic good turns that are duplicated gain and again An appropriate line of solion work was sasigned the scoute at police work was shaigned the scouts at Farpo, in stopping venous pranks on Hallows en night It is the common thing for spouts to be called upon to hunt lost children. And as stated, firmanship is proving one of the best means of utilising exuberant energy Great tastes, these, of manhood responsibilities that he just

The war has doubtless taught all nations the need of conservation of natural re-sources. What's that got to do with a glerious outdoor hike on Lincoln's Birthgorius duxion mine on Lancon's Birthaday? Nothing. But come to think of it, Abraham Lincoln was a rail splitter What of that? Well, doesn't that suggest splitting wood? Why not a fuel hike when every scout gots out his scout axe and gets into the woods and converts fallen timber into firewood for the needy?

And it wasn't only on Lincoln's Burthday by any means that the socute practiced that form of conservation Anti-destructiveness is an underlying principle of scouting Men who lay hold of the responsibilities of government with that idea imbedded in their natures, will never be grafters

Too much cannot be said in commendation of the method of education that makes a boy delight in doing



Boy Scents acting as sides to the Fire Department get fun and valuable training of every description

well such serious things as these. You can imagine the thrill of pride which young scouts of Abilene Texas felt when they helped the Chamber of Commerce to rete was tasy supped the channer of Commerce to promote a municipal water system and to select a site for a mechanical and agricultural college. Something has happened when a boy instead o throwing sticks and stomes up into a horse-thestnut tree and shinning up any tree along the walk that takes his fancy regardless



When boys will do this for the health and beauty of their town civic service has them for keeps

of broken branches, will laboriously make a complete census of the 14,083 trees within his city s limits tabulat consists of the 1s,005 trees within the city w 11,590 natural gas users between 10 P M and 3 A M to turn off their jets because of in accident has stored up for the days of his maniful time the power that arises only from a sense of responsibility. The climax thus far in the development of the Boy Scout Daily Good Jurn into organized civic service was the tremendous contribution of the Boy Souts to our Covernment's conduct of the war. These scouts at must be remembered are boys out of our own home. They are not phenom of our own homes. They are not phenomerical loys. They e me from all kinds of hom s of all nstronalities of every religious erect. They run from 12 to 18 and Injoins erect. Into run from 12 to 18 and 19 years of age averaging around 151/2. They are the sors of poor people and of rich people and of in between people. They are likable lads and lads who are Inny are insule inos and inos who are lard to like. They know how to behave or they are little rulhans willing to learn Just plain American loy. But the scout-ing program grips them the stern Oath and Law with its 12 points. gives them moral backbone. The program of out-door activities gives them expertness in athletics and camping and in wood lore Successive stunts in civic service tone up their sense of solidarity. The Nation is forced into a war with another nation, and from sea to sea this great brotherhood

and from what to sen this great protections of plan American boy keps to tis feet and flashes to the President a sturdy message. The Boy Secoula of America stand for 100 pr. c. nt poirsottem and unqualified and energetic support of the footenment in every way.

Follows without comment the stirring record that

made that message good
In three Liberty Loans made 1 343 018 sales amount ing to \$206,862 950

Returns to date on Fourth Loan in dieste over \$100 000 000 of sales

Sold Was Savings Stamps to the value of \$22 997 260 and still going strong Located 20 758 660 board feet (5,200

carloads) of standing walnut Collected over 100 carloads of fruit pita. enough to make over one-half milhon gas

maska Responsible for over 12,000 War Gardens actually reported with thousands more not reported in detail. In addition to

this many thousands of scouts worked on farms Distributed over 30 000 000 pieces of Government literature

Assisted Red Cross continuously in its work and served in every membership and financial drive

Assisted the United War Work Cominitiee a campaign for money Collected great quantities of books for

Performed many services for the selective

telligence Bureau This nation can no longer afford to let

the boy power go to waste It is not enough that it shall construct muscle and good constitutions. We must have more by products such as these. There are 8.10.12 million boys in this country all the time. Only shout five pre-care of this year total is under leadership that conscrees their power, directing it back upon themselves in self improvement and directing it outward upon the community in civic (Continued in page 108)







Making a model of a bridge that will later be erected for actual use outdoors

The Heavens in February, 1919

A Few Suggestions as to the Ages of the Stars

By Professor Henry Norris Russell, Ph.D.

WE had occasion last month to speak of the extra-ordinary brilhancy of certain stars in Orion and the neighborhood. Such objects challenge the imagination in many way: -their great size, extreme ness, and the very high temperature to which they own their luminosity. But they are most impressive of all when we consider them, not from the standpoint of the present moment, but from that of their past history and

probable future docution

Estimates of the brightness of the stars, of very fair precision, were recorded by Hipparchus, more than two thousand years ago. These suffice to make it certain that the general aspect of the constellations, as regards that the general aspect of the constitutions, as regards the brightness and the position of their stars, has not changed perceptibly in these 20 centuries. Indeed, the tew doubtful cases, in which it looks at first sight as though a few stars might have changed in brightness, are more probably due to errors in the early estimates, or in the copying of the manuscripts, than to actual

changes in the sky Direct human observation makes it clear, therefore, that in the life of a star 1,000 years is but a short time. This is of course what we should expect, from our present knowledge of the great age of the Earth, and of the life which has for so long heen evolving on its surface. On general principles, we might well expect to find that the life of our solar system far exceeded in length that of this little planet of ours, and that the life of the great system of stars was again far more extended in duration than that of our own small part of it. But what evidence, direct or indirect, do we at present posse

The Geologist's Contribution

Let us begin with the age of the Earth-or, rather, of the fossiliferous strata upon or, rather, of the lossifierous strata upon it, which, as all geologists agree, give us only the latter part of the history of the evolution of living things. This is not the place to enter into details regarding the arguments which have led geologists to make rough numerical estimates of the ages of the various formations; suffice it to say that all are agreed in placing the interval when a large variety of highly organised living things already existed—at a figure which can be measured by the tens millions of years at the very least. The only question still under dehate is wheth an estimate is not too short. Certain facts regarding the accumulation of helium in minerals containing uranium—which produces helium by a very slow radio-active proces—indicate that the age of

active process—indicate that the age of the older sedimentary rocks is a thousand million years or more. If we say roughly that the time during which life has existed on the earth is probably at least a hundred million years, and perhaps a thousand million, we shall be not far from expressing

the state of scientific opinion.

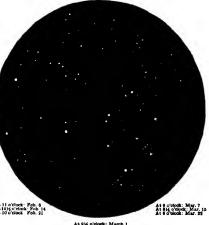
Now it is morally certain that, during all this enormous interval, the Sun has never been, even for a few years, very much hotter or colder than it is now. If its radiation of heat had been but half as great as at present, the whole surface of the Earth would have been ice-bound If the Sun had been three or four times as hot and bright as it is now, the oceans, rivers and rain would all liave been nearly if not quite at the boiling point. Either of these catastrophes would have put an end to the orderly development of life, and neither is consistent with the ical evidence. Indeed, a range of solar radiation from two-thirds to twice its present intensity seems to be about the utmost that can be admitted, and this corresponds to a change of hardly more than one magnitude in brightness, while the differences in brightness among the visible stars of the sidereal system amount to fully wenty magnitudes. It looks, therefore, as though not merely 2,000 years, but the whole of geological time, were but a short interval in the history of the Sun.

The Origin of the Stare

Further argument in favor of this view is found in the well known planetesimal hypothesis of Chamberlin and Moulton—according to which the solar system originated

by the eruption of hot masses of material from the Sun by the cruption of hot masses of material from the Stu-under the influence of the attraction of some other star which passed so close to it as barely to miss intiting it. On this hypothesis, which is supported by many lines of reasoning, the orbits of the planets wore originally of considerable eccentricity, and have attained their present nearly circular form by the action of the resis-tance due to the swarm of small particles diffused about the Stun. Mr. Jeffreys, an English astronomer, has recently scaleducted that, upon plausible sammptions, tary orbits in this fashie required to round up the plane-tary orbits in this fashie or the study of the study to the study of the study of the study of the study of the thousand million weats. This firs in were well with the they order in Linkshots among he sometaing like three thousand million years. This fits in very well with the longost estimates of geological time; but it also indicates that the sun was a "going concern" 3,000,000,000 years ago, and must therefore, be older than this by a wide

If the ages of the stars are of at all this order of mag-nitude, what hope have we that the slightest change in the condition of any one of them can be detected in our



NIGHT SKY: FEBRUARY AND MARCH

ephemeral lives? Little indeed, one might answer; but the problem is really not quite so bad as that. Recent researches—largely by Eddington and the present writer—make it probable that a star start size life as a huge body of highly ranfied and relatively cool As it contracts it becomes hotter and hotter, until at last it gets so dense at the center that it can no longer at last it gets so dense at the center that it can no ionger contract freely. Then its tagge-sture has attained a maximum, and it begins to cool off, and finally, after the lapse of sges, goes out. The Sun appears to be in early middle age—well past the maximum of temperature, but with still a long life of moderate scivity before it. But win suin a long life or moderate activity octors it. But there are many stars—such as Arcturus and Antarea— which present the evidences of youth. They have not yet rison to their greatest temporature, but are already very bright, because they are of such large diameter. Such stars must live their lives at a very much faster rate than the staid old Sun, and the rate at which they are shrinking should be rapid indeed. Even so, it would be hopeless to attempt to detect its effects, except in one

What the Figures Say

These are the Cepheid variables—stars of great bright-ness, and evidently at an early evolutionary stage—which probably one their variation to periodic vibrations of some sort affecting the main mass of the star. Now if this is true, the period of the vibrations should depend

upon the density of the star. For an increase in density of 2 per cent, the period should shorten by 1 per cent Some of these stars have been observed carefully for Some of these stars have been observed caractury for more than a century, and in one case at least—the typical star Delta Cephei—there is evidence that the period of varietion, which is rather more than five days, is actually growing shorter at the rate of one-twentisch of a second per year; that is, hy one nin-millionth part of itself every year. This indicates that it would take the a second per year; that is, by one nin-minionic part or itself every year. This indicates that it would take the star about forty-five thousand years to increase in donaity by one per cent, and 3,000,000 years to double its density. To pass from one to another of the stages of temperature which are represented by the Harward star like these, something like a teofold increase of density, which would call for some ten million years.

This estimate, which is due to Eddington, is of great interest as the first piece of direct evidence, derived

interest as the first piece of direct evidence, derived from the study of the stars themselves, and bearing on

from the study of the stars themselves, and pearing on this great problem of their ages. It is admittedly very rough at present; but when more such stars have been studied, and if their periods are found likewise to be shortening, it may be possible to get a very fair low. it may be possible to get a very fair ides of how fast a giant star lives through its early stages.

the control of the condition of a red star. To go from the condition of a red star like Antares or Betelguese to that of a very white one like those in the head of Scorplo or the belt of Crion involves passing over five successive steps, on the Harvard scale of the magnitudes just referred to. This would probably take more than fitty million years, for the changes would go on more slowly as the maximum temperature was approached. The later stages of a star's life, while it is cooling off, must last a star's life, while it is cooling off, must last heat per year, and there is a huge store of heat necessarily start of the comments of the control of the comments of the control of the comments of the control of the comments of t surface before the star ceases shining. From such evidence as we now poss

therefore, it would seem that such great stars as those of Orion's belt have already en shining for many millions of years— erhaps for a hundred millions or more while their future duration as light gi before they finally cool off to the point of extinction is likely to run into the thousands of millions of years.

The Heavens

The finest region of the sky is now in the The finest region of the sky is now in the southwest, where Orion hangs resplendent, guarded by Taurus on the right and Canis Major on the left, with Canis Minor, Gamini and Auriga above. Jupiter, which is in Gemini, and at our hour of observation ways high in the sky, adds to the brilliancy of the scene.

The most conspicuous constellation in the eastern sky The most conspicuous constellation in the eastern sky is Leo, which ske gains by the presence of a planet—in this case Saturn. Hydra rears far up from the south-seatern horizon, while Virgo and Bootes are rining in the east. The Great Bear is high in the northeast, Draos and Uras Minor are east of north, with Cambogies and Capheus in the north and northwest. Perseus, Andromeda and Arise—the last two low in the northwest—complete the tale of the prominent constellation.

The Planets

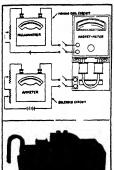
Mercury is a morning star until the 23d, and an evening

Mercury is a morning star until the 22d, and an eventing star after that date, but is so far south and so near the Sun that he is practically invisible all through the month. Venus is an evening star, and is now drawing out from the twillight and coming farther north, so that she is getting to be a compisious solpied. At the beginning of the month she sets at 6.25 P. M., but at its close she remain in sight until 7.40. She is exclusily about three times as bright as Jupitor, but will hardly look so, being much lower in the sky and on a brighter background. Telescopically the shows a small and sincet dreular disk, 11 seconds of arc in diameter.

Mars too, is an evening star and is in the neighborhood Mark coo, is an evening our and is in the neight-whose of Venus, but is only about one one-hundredth as bright. Even so, he much outshines any fixed star in the neighborhood, which is rather a dull region.

Inventions New and Interesting

A Department Devoted to Proneer Work in the Arts



A motor which determines the qualities of permanent magnets

An Instrument which Decides the Magnetic Qualities of Magnets

THE wide use you and any appear or the proposal of the present of the rest in the finished condition while the proporties of permanent magnate and the desired present material can be determined with high accuracy with a permeaster, such apparatus in ode designed for and cannot be authoritory employed in determining whether or not magnetized shape satisfy

definite requirements or specifications. An instrument designed for testing permanent magnets abould be capable of estinglent and a second of the second of

A high initial flux will not be obtained in the use of poor material or under unfillednt magnetising conditions. But were a high nuttal flux has little to recommend it, if the material employed has not the capability of resulting to a high degree the deteriorating induscess of vibration, changes of temperature, and the possible hauriful effects of other magnets with which it may be assembled. A stability measurement determines the proporties

this sequence of the country of the

intended for use in connection with the construction of electrical measuring in struments

The base of construction of this new moter and the pranciple of operation will be clear from the following A coil cap able of rotary movement, to which is attached a pointer traversing a calibrat of scale, is supported between two specially shaped pole pieces. This mov able system and scale are enclosed in an airtight housing. The pole pieces are extended through the housing into contact faces or plates, to which the polar por tunns of the magnet under text are applied. When a definite current is allowed to flow in the moving coil, a defection of the pointer occurs which is proportional to the low in the magnet apportional to the low in the magnet ap-

plied to the contact faces
In measuring the magnetic stability of
the magnet, two adjustable solenoids we amployed which are located in front of
the contact faces so as to encircle the
Continued on page 107)

Trimming One's Own Hair by Combing It

WITH the extensive introduction of the aslety rasor, the barber lost a good part of the former electrical and now with the gradual introduction of a simple hair-training device which appears to complement the safety rasor in a most efficient way, the barber is confronted with a further curtaining of his trade. Indeed, it is now possible for anyone to be his own barber.

comb s to the line no way is it possible for the user to become out while the device is being employed in the regular manner. The blade holder may be used over any part of the comb with the fine tieth of the coarse teeth according to the wishes of the user.

To true one shar with the new device it is only necessary to comb it About the neck and the ears where the hair is 10 bit trimmed quite closs the comb is hild flatly against the haid whilt for sight trimming the cutting edges are hild farther away. It is risined that with a little practice anyone can master with a little practice anyone can master thus realising not only a considerable saving in the course of a year but sue criding at all times in keeping the hair trimmed to the proper length.

A Fountain Which Uses an Electric Lamp for the Pump

NOTHING could be simpler than the electric fountain depicted in the accompanying illustration. This device has been recently patented by Matt lucknesh of Cleveland who is a well-known physicist and a contributor to these collusies.

It will be noted that this simple fountain makes use of a 150-watt high efficiency electric lamp placed in the upper part of an artight vessel partly filled with water and having an outlet tube connecting its lower portion with a noisile of capillary dimensions. The expansion of



Anyone can trim his own hair by means of this simple device, which employs blades of the type shown

The new hair-trimming device is nothing more than a plan comb, fitted with an attachment that holds two special steel blades similar to those used with safety rasors. The blades, as will be noted in the accompanying illustration are held so that the cutting edges arther proper distance in from the tips of the

the air above the water, due to the heat given out by the lamp, forces the latter out through this noise and the spray is caught and owrflows into an outer vessel. When the current is turned off, the air pressure falls and the water returns to the inner vessel through a check valve at the bottom as shown in the sketch



A phenograph sound-box of old construction, which makes use of highly stretched slik for the displacem



A 150-watt tungsten lamp does the pumping for this fountain

A Phonograph Sound-Box with a Silk Diaphragm

THERE has been no end to the various kinds of materials employed in phonograph reproduces or sound boxes Paper, hard fiber hard rubber or esboatic, excellent of the product of the produc

possess considerable merrit
It has reminsted for Donald M Bliss of
West Orange, N. J., to patent a phonotic orange, N. J., to patent a phonotic orange of the property of the patent as the set of the patent as the pate

Bredly the idea of this sound box disheredly the idea of this sound box disheredly the idea of this sound box disheredly the idea of the inventor, as to have a covering the inventor of the idea of the thin central member of high density, these vibrations well reproduced by the thin central member of high density, these vibrations not being distributed to any considerable extent in the mass of the larger member to which the thin dense dak is secured. At the same time, the same and inertia of the main portion of the disphragm results in the faithful proproduction of tones of lower pitch in proper balance. The inventor is clearing that the scratch, is largely suppressed by his sound box As a matter of actual controlled in the control of the control of the controlled in the The machine producing its output at lowest cost is the machine you can make most money on—and other things being equal, it's the machine with a





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The Current Supplement

THE valuable paper on The Rôle of Selection in Eschwiston in the current assue of the SCIENTIPIC AMBRICAN SUP-PLEMENT No 2248 for February 1st 1919 deals with some of the widely divergent deals with some of the windsy divergent views held by investigators of organic evolution and the discussion will be of great interest to students of this important subject Food problems promise to be of vital significance to the greater part of the inhabitants of the world for a long time to come and it behooves everyone to devate more attention to them than has ever before more attention to them than has ever server been considered necessary. In this con-nection the study of new kinds of food materials is of great importance with a vew to hightening the demand for the limited number of foods that most of us have considered essential The world contains many materials that are now but slightly utilised or only locally which could easily be made to add to our supplies and diversify our rather narrow bill of fare to general advantage An article in this issue of the Supplement on The Palate of the Civilized World deals with this subject and describes a number of new foods almost unknown in this country and several of them are shown in accompanying illustrations It is of unusual value and interest to everyone An hieror Magnetic Alternating Current Rectifier gives very ings that will enable any amateur mech to make this useful mere of electrical anparatus The Production of Copper gives a brief account of how this indispensable is reduced from its ores and in accompanied by a number of excellent photographs Other articles of value in this issue include Electrical Welding in Shipbuilding A Wax Medium Process for Permanent Coloring of Photographe, Rems-tance of Ships Undamped Currents in Super-Conductors and The Constitution of the Earth & Intersor

Wireless Telephony Between Airshins and Ground Stations

(Continued from page 95)

pliotron As for the action of the pliotros in converting the direct current into high frequency undamped waves space does not permit of a lengthy explanation

An ordinary transmitter is amploye in connection with the sending set just described Ranges of 25 or 30 miles are readily obtained between airships and ground stations for greater ranges the transmitting set can be used to send out undamped wireless telegraph signals, by means of the regular telegraph key The receiving of the telephone messages is receiving of the telephone messages is effected by means of a compact receiving set which also employs vacuum bulbs for detecting and amplifying the inter-cepted waves. Instead of the usual head cepted waves Instead of the usual head receivers a loud-speaking telephone can be used so that the messages can be clearly heard throughout a large room.

The transmitting apparatus used by the Navy is of the most rugged character, to withstand rough handling and the intense vibration aboard airplanes and dirigibles slike The photrons are protected against vibration by ingenious systems of spring suspension or by soft rubber pads.

Battery Versus Magneto on the Airplane

(Continued from page 98)

magneto custed that would fire all the cylinders at the rregular angle after he had shown how it was to be deen all the cylinders at the rregular angle after he had shown how it was to be deen and the cylinders at the regular angle after he had shown how it was to be deen commercial purposes the simble is superior and the cylinders at the regular angle after he had shown how it was to be deen commercial purposes the simble is superior and the cylinders and the cylinders and the cylinders are the same always. All suggisted like the post the creprimenters or old to for the moment was to make their parts may be removed and replaced by the condition of the condition of the cylinders and the cylinders are the conditions and the cylinders are the conditions and the cylinders are the conditions and the cylinders are the cylinders and the cylinders are the cylinders and the cylinders are consideration of the cylinders are consideration of the cylinders are consideration and the cylinders are consideration and the cylinders are considerated as the cylinders are considerated as the cylinders are cylinders and consideration and considerati

like rotary pole engineers had built a support of the control of t code that an armsture magneto could not be made to fire the Laberty, so assuming that the retary pole was ignored, the use of the word impossible can be explained. But it can never be justified in 1917 the rotary-pole was no freak or novely, vit was on a firmer basis than when the Alles began at use in 1915. There could be no excuse for not considering it or in con-mission of the country of the country of the flexibility made (seashbe its adaptation to any motor in the world

any motor in the world

The magneto makers feel that in the The magneto makers feal that in the matter of Liberty ignition they have been lynched. They feel they were given no chance to show that the magneto could be made to fire the Liberty and that on the basis of the adoption of the battery a departure that must excite universal comment—the impression has been created that something must be wrong with the magneto. This of course is not the case

The Status of the Marrate

The only thing that the Liberty proves The only thing that the Liberty proves at that a plane can be fired by a battery Magneto makers would have conceded this they will never admit that there is any sold reason for wanting to fire a plane with a battery. Had the aircraft mtuation with a battery! Had the aircraft statation been no desperate that the three weeks data involved in adding for a modeled and involved in a state of the modeled and involved in a state of the battery which was all ready and worked out would have been justified. But the wholesale changes and revisions made in the motor even after construction was begun negative such a suggestion. These changes magnete makes feel, make it clear that they were not given the table of the state of the sta been so desperate that the three weeks

to be applicable is difficult to explain

The magneto is doing business at the old
stand All non-experimental planes that
do not mount the Liberty are fired by
magnetos Trucks and tanks and all the magnetos Trucks and tanks and all the other machinery of combat and mobilisa-tion and demobilisation mount magnetos uon and demobilization mount magnetos by the thousands. The rotary-pole magneto cannot be made in its own fastory, in sufficient numbers to meet the damade of the Government and of private users—although that factory has been expanded repeatedly lits makers have had to liteness ten manufacture by other disching the magneto a position, than describe the magneto a position, than describe the by that house. We need not here disket by that house. We need not here disket out he self-statewer of standardisation and

standardized equipment recently designed by this house We need not here dilate on the advantages of standardization and interchangeability they are known. But the man who undertakes the standardiza-tion of magnetos is food with the fact that different numbers of ophadra and different angles and different bissing lead to vastly angles and different bissing lead to vastly the different bissing the standardiza-tion of the standard by the standard by pole magneto set to work on the scheme for a universal magneto applicable to any searns.

mechanical difficulty, and with the simple tools provided with the suffit So iff you want to shift you want to shift you want to shift you magneto from the night-cylinder empire for which it was bought to a 16-vylinder, 45-degree, V-type engine, all you have to do as to look at the chart provided to call you what parts to remove and what ones to put in their places Having substituted the proper distributing block, grave, cam, brush, rotor and field structure, the thing is done, you put the same old magneto on is done, you put the same old magneto on the new engine and it fires it.

Airahip Versus Airpiane

(Continued from page 89)

This requirement is much easier to fulfill on airwhaps than on airplanes. Not only is the question of weight of mines impertance on airwhaps, the whole anothicecture of these craft is more adaptable to comfort than even the large airplans. It is obvious that a hull some 700 feet in length affords a splendid opportunity for fitting cabins, during rooms, lounges, etc., at such a distance from the propelling apcabina, dining rooms, folinges, etc, as such a distance from the propolling apparatus as to virtually suppress in the living quarters any nose caused by engines and absenced furthermore, and the suppression of the virtual control of virtual suppression of the suppression of the virtual control of virtual suppression of the suppression of the virtual control of virtual suppression of virtual suppression

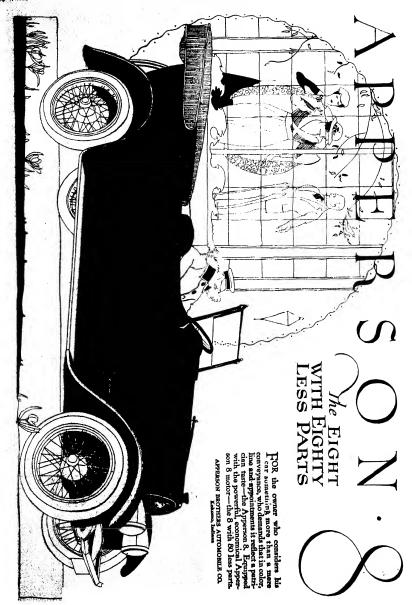
Prime Cost and Man-Pow

Prime cost of aircraft is an item difficult if not impossible, to estimate in the light of our present knowledge for lack of data based on experience Tentative figures on the prime cost of commercially adaptable sircraft have been worked out by the British Committee on Civil Aerial

Airplane (high speed) Airplane (low speed) Airplane (rigid) 18a 18a

As to the man-power required for operating airchips and airplanes, respectively figures published by the British Air Ministry indicate that airships are As Ministry indicate that atmittes me more sconomical in man-power than beavier-than-air craft These figures show that annihips employed 162 mea per bour flown, as against 5 52 for alrybanes and easplances and fare 104 heurs per more employed as against 0 40 for airplanes and scaplances.

It may be said in comple







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ng Equipment and Engineering Co 184 Parlery! See

Harnessing Boy-Power

(Continued from page 101)

continued from page 1811
service And yet consider what that five
per cent did for the Clovernment in the
conduct of the war!
Mr George W Edwards of the United
States Limployment Service stated in a
recent newspaper article that Boys are
everywhere leaving the classrooms for the everywhere seaving the classrooms for the factories and shops, so that school at-tendance is being seriously affected. In one large eastern state the loss for the last one large eastern state the loss for the last two years is 18 per cent from the enrell-ment to be expected in normal times. When these boys enter war industries most of them work as messengers water carriers, or helpers Because they are receiving big pay envelopes they have little inclination to enter as learners in skilled employment which offers a lower initial wage. If left which offers a lower initial wage. If left unchecked these social tendencies would unchecked these social tendencies would develop a large untrained and unakilled populatior. This would prove a serious handicap in the reconstruction period which must follow the war when the nation will need increased production and effi-ciency to restore the depleted supply of economic so

economic good.

In view of such a serious statement by such an authority, the program of the Boy Scouts of America becomes of vital importance to the nation. It is a program of preparedness in the duties of ettiesnahip Be Prepared is the slogan of the Boy Scouts. This country has never witnessed that the state of th Scouts This country has never witnessed such a spectacle as the mobilisation for national service of nearly 400,000 uniformed boys, who proved themselves prepared to perform difficult tasks efficiently It is not so much the mobilizathe period of reconstruction, that makes the program invaluable But rather, the con tribution that scout trained boys individually will make to every line of industry and in every profession, when they enter upon the duties of manhood

upon the duties of mannood Mau-leadership is the key to the success of this great movement Nearly 30,000 soutimasters and assistant sooitimasters are directing the work of these 335,000 boys 'Plan American men' these sooitimasters' Fellows of unassailable characters by the same than the same tha matters remove or unamanistic char-acter, big of heart, believers in boyhood, willing to learn the scouting program willing to give of their time and strength to a big task like this. As a matter of to a big task like the As a matter of fact, most of them get as much out of the program as the boys do, for no man ever loses his boyhood. It may have gone sound salesp, but it is made him yet And the munute he hears in his mner vonce the call of socuting, BANG! there is his boyhood out of bed and the scout uniform half on

ani on It is the simplest proposition imaginable to harness the boy-power of the nation And yot it is a far greater, more important And yot it is a far greater, more important proposition than harnessing the water power of the nation. And it is just as easy to spot the waste of boy-power in your town, as to pount to the waste of power in a racing stream. And the problem is a community problem. Harnessing the boy-power by means of the Boy Scout program, calls for community the community. power by means of the Boy social program, calls for community interest in the boys In view of what can be done, it would seem as though no man could rest content until be had done his part toward conserving, harnessing storing up the boy-power of his town for the boy himself and for his town and for his country

The Heavens in February, 1919

(Continued from page 102)

On the 13th Mars and Venus are in conjunction, the brighter planet being a little more than half a degree south of the other more than half a degree south of the other Both are moving eastward, but Yeaus as gaming on Mars by nearly half a degree per day, so that she appears lower in the sky than Mars before the 13th, and higher after that date Thu conjunction will be easily observable, just after dark, and will have the conjunction of the conjunc-tion of the conjunction of the conjunction of the conjunc-tion of the conjunction of the conjunction of the conjunc-tion of the conjunction of the conjunction of the conjunc-tion of the conjunction of the conjunc-tion of the conjunction of the conjunction of the conjunction of the conjunc-tion of the conjunction of the conju

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JET economy begin in the power plant! Beasomer Oil Engines set new low coats for power production. Opnating on low priced heal and made oils, they reduce your power black fifty to sightly seasms, at the contract of the production of the production of the power power black fifty or the production of the power power black for the production of the power power power black for the production of the power powe

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in the east at sunset and crossing the meridian at 9 P M in the middle of the month. His satellites present an interesting telescopic spectacle, especially on the early morning of the 19th when the first of them is in front of the planet, and the second and third behind it or in its shadow.

second and thard behind it or in its snarow Saturn is in opposition on the 14th and is visible all night long. He is in Leo and considerably outshines its brightest star, Regulus. With the telescope it becomes evident that his rings are seen much more nearly edgewise than a few years ago, for the poles of the planet project far beyond them

plet in toyong usens monitored with the Sun on the 17th, and is invanible this month. Neptune is just past opposition, and may be observed with the telescope, his position on the 2d being it. A flat of the Sun of the Sun

The Moon is in her first quarter at 2 P M on the 7P M on the 14th, in her hast quarter at 9 P M on the 22d. There is no new moon this month the previous conjunction with the sun having fallen at 9 P M on January 31st while the next is not due intil 6 A M on March M This rather unusual occurrence can only take place in February, the other months being longer than the moons.

2d The rather unusual occurrence can only take place in February, the other months being longer than the moon synchologiscope of the control of the control

Washington D C January 20th, 1919

An Instrument which Decides the Magnetic Qualities of Magnets

(Continued from page 108)
respective legs of the test magnet If
current is allowed to flow in the propri direction through the windings of these
solenoids when the pointer is deflected in reading the flux the diffection may be reduced to sere by regulation of the current.
The value of this current is a direct
measure of the stability of the magnet.

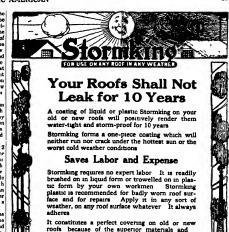
The value of this current is a direct measure of the stability of the ningnet. The measurement of flux dove not affect the magnet remains unchanged. The measurement of the magnet remains unchanged. The measurement of stability as will be seen involves a demagnetization operation and the magnet ninch be remagnetized after such a text. In practice therefore, the flux text may be courred active such a text. In practice therefore, the flux text may be courred active and the such product active the such as the

The design of the meter is such that the pointer moves at all times to its deflection value or back to sero without coulising through its final position. In other words, the damping of the matrix ment is entirely independent of the flux of the magnet under test. The scale is provided with a parallax mirror and is 5½ inches in length, being uniformly graduated into 180 divisions or 18 grand divisions. These grand divisions are marked so as to provide a scale reading 8-0-18. Means are provided for setting the pointer on sero.

to the pointer on serve provided for setting from the mount of the moving coil in provided by metal suppre and lower suppressions of the moving coil in provided by metal suppressions. The suppressions which are in terms on This furnishes is movement of great sensitivity while rendering unnecessary the leveling of the instrument. The special construction and robust sharshers of these suspensions makes their breakage practically impossible even under the most carelees handling of the instrument.

The instrument is rapid working and

The instrument is rapid working and reliable The design enturely eliminates the reardual effects which might affect readings, due to weak magnets following streng ones in the course of routine tests. The output in the moving coff struck a sundisid from a dry cell, while the current



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THE DESIGN AND CONSTRUCTION OF INDUCTION COILS

By A Pre lett k C na 6 M/19 M/1 bes (1 th 272 pages 159 illustrations 15 80 by mail 35 65 Tlass rkg ves non n to do nisf 1 pains at estons from king ght different assess of order seysing a read of the standard of seeds and respect to a read to see a read of the seysing to see the set of the seasons of seeds and respect to the set of the seasons of seeds and respect to the set of the seasons of seeds and respect to the seasons of sea



Over Thirty Million Square Feet storage lat r. Contact above are produced from a 6-to 8-volt graded for the form of the policy of the test magnet and the ct plates in cases where the ends of the magnet are not finished

The Paravane (C' ntinued from page 91)

The pursuane has its limitations to be ure. There is involved the element of han as in many other phases of warfare. chan as an many other phase of wariates.

If ite ship equipped with parasanes
strikes a mee nose on nothing can save
it fr m a smashed bow which entails the
flooding of only a small portion of the ship But if it passes a mine but a few feet to one side the paravanes take care of that more in an efficacious manner stated that the British fleet assigned to visit the German ports following the signmine fields without an untoward incident thanks to their paravanes

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THL Scientific American Publishing Company announces the publication of A Company announces the publication of a 296-page catalogue of scenarific and technical 1 ks. The catalogue hats about 2 500.1 ks. under 400 headings and in many cases as hit description of the book is given I mining paper and binding have advan ed enormously in the last year and it must be said for the publishers that there have been the last to ruse the action. and it must be east for the publishers that they have been the last to raise the price of their commodity. It is doubtful if tachin all books will ever be produced cheaper than at present and they may go hagir therefore this is a logical time to purchase in what is a fair if not a low market. The greatest possible care has been used in the selection of tales so as to Deen used in the selection of tuess of an all obsol te and doubtful titles have been eliminated. The selection was made after 7000 titles were compiled. There is little question that home study is the key to success New conditions in business pro-fessions or trade can be promptly met by acquiring new knowledge which can be gained in spare time by means of books It is such knowledge that keeps successful men alreast of developments in their prospective trades professions or business No matter what knowledge one requires it is almost certain to be found in book wh is can be looked up and supplied. The Scientific American Publishing Company swell equipped to handle all inquiries relating to books and our readers are earnestly requested to send for a copy of this catalogue which is mailed free to any address on application

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WHII L excellent paving brick is being made from English blast furnace slags an equivalent product has not yet been made in the United States

British practice consists in pouring mol-ten slag i it split metal molds removing ven siag it; split metal mode removing the rid hot bricks when they have soldified suffice tely to be handled without defor-mation and placing them into kilns where they cool and anneal slowly. Those bricks have

ination and placing them into kins where they cool and anneal slowly. Cuture they cool and anneal slowly. Induce bretch have a stooy betture manner are glassy and british a ministrument of the sign probably has a great deal to do with these conditions the British slag containing 20 per cent adica and 22 per cent alumna while her as the corresponding winounts are 34 and 14. In practice, American slag quickly solidily with a tiding and the state of the state shall cool at short the state eater from 12 to 18 hours being required



THE R. SI DRIVE THE CRESCRIT MACHE



GOOD IDEAS AND INVENTED Con be estand into money for the party will be for the party for the par DEAL MACHISE TOOLS

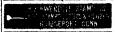
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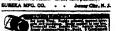
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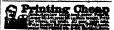
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THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX]

NEW YORK, FEBRUARY 8, 1919

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Dissurcting an arrigance trous an arrigance by no means new as the idea of launching an airplace of the man airship. For many years past artusts have shown large displace carrying one or more airplanes, for military and peaceful purposes. But it u one thing morely to confine such dieses to paper and quite another to realize such an achievement, and it is in the latter estagory that these commany substration falls: It is hand one studied.

the configuration of the proposer in the tools thing merely are above revenued and the revenued as a characteristic and quite another to resting such as achievement; and river and quite another to resting a such as achievement; and the secondary and the accompanying flustration falls. It is based on actuality Several weeks ago the experiment of launching an ampliane from a dirightle was successfully carried out at the tooksawy Beach air station of the Navy near New York city. One of the large Naval airships was brought to the clock and the secondary of the same of of the latter. These preparations completed, ballast was dropped from the dirighble. The airship rapidly rose to 3,000 feet, These preparations completed, ballast was dropped from the dirighble. The airship rapidly rose to 3,000 feet, with the diminutive arripines wanging about it, at the end of the 100-foot ashle. At the proper moment the airplane with the ending "deed," or the same of the 100-foot ashle. At the proper moment the airplane whose the same of the 100-foot ashle. At the proper comment the airplane which the ending "deed," or the same of the 100-foot ashle. At the proper and the proper of the same of the 100-foot ashle. At the proper was the same of the 100-foot ashle. At the proper of the same of the 100-foot ashle. At the proper of the same of the 100-foot ashle. At the proper of the same of the 100-foot ashle at the same of the 100-foot ashle. At the proper of the same of the 100-foot ashle. At the proper of the 100-foot ashle at the 100-foot as

Method of attaching airplane to a hellum airship of the near future

Dynamiting Devastated Orchards in France

Dynamiling Devastated Orchards in France

An interesting new method for the rehabilitation of
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of the Franch orchard des stated by the enemy was
Mander Prédallu. The Anne Anders proper to the state
Mander Prédallu. The Anne Anders proper to the state
Mander Prédallu. The state of the Anne designed to the open of the country of the requeues fertilizes with tight. The author had noticed the
specially vigorous development of wild piants around the
specially vigorous development of the state of the piants
was supported to the flavored piants.

The Anne Mander Ma supported by some experiments made several years

ago in the wostern part of the United States in which two year-old chirry trees planted in hois sexuated by dynamite reached the height of three meters (about 10 feet) while similar specimens planted by a pende re-mained spindling and grew searcely half as tall M. Piedallu applied his idea by placing a suitable amount of fertiper in a container surrounding the explosures in acts away that the force of the xipl sions

explosives in such a way that the force of the xplession would drive the former into the minute cracks produced thus forming an ideal medium for the growth of the young tree. The formula of the explosive is not given but it is stated that it is not affected outlier by concussion or dampness is capable of being molded is completely free from chlorates (which might injure vegetation) is fret from chlorates (whire mignt injure vegetation), is highly energette in small volumes and tannot be de-tonated except by a fullminating cap. The fertilizers employed are chosen with special reference to the char-acter of the earth and the needs of the trees to be planted

The compressed fetulars model are not be planted. The compressed fetulars model are not be planted of the explosure is placed in the bottom of a tube of charge and the placed in the bottom of a tube of charge and the planted in the planted planted planted in the planted planted

somewhat irr er in manueur man the carriage. And hole should be 60 or utmerter deep (about 2 feet). The explosion produces a spheroidal cavity some 80 centimetres in depth (about 40 inches). The carriage the subscript the vapors liberated and the young tree is then piaced in the hole and its roots covered with the carth

SCIENTIFIC AMERICAN

Published by Scientific American Publishing Co. New York, Saturday, February 8, 1919 Muna & Co., 233 Breadway, New York,

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The object of this nournal is to record accurately and bucility the latest scientific, mechanical and industrial news of the day. As a weekly nournal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

A Solution of the Railroad Problem

THE operation of our railroads by the Government has taught us certain lessons as to the practical value of cooperation, which should form the basis of any new system of control that may be adopted. Having said that, we wish to go on record as being opposed to complete governmental ownership and control of the railroads.

A business organisation that employs 2,000,000 mes and upon which, therefore, 10,000,000, or ten per cent of our population, is dependent for a living is a mighty factor in determining the national prosperity. When we remember that it was transportation, making over our vast network of railroads, that opened up these United States and brought them to their present high stage of development, it will be admitted that the stage of development, it will be admitted that the approximation of the properties of the properties as that of a permanent or even lengthy change from private to governmental operation, should be approached with the greatest restraint and weighed in the scales of calm business ludgment based on post experience.

The issue is between governmental ownership and operation and private ownership under reasonable direction and control by the Government; and we believe that the safe way out of the present difficulties lies in a whole-hearted adoption, by the Government and the people, of the second alternative.

It is American indistive and the competitive spirit that have made the agricultural, mechanical and industrial devolopment of the United States the wonder and admiration of the world. Therefore we should be very slow to make any change that might curtail initiative and we should set our face like adamant against any sweeping change that would kill it.

We do not know of anything that would, and does, so quickly and completely kill initiative as governmental ownership and control.

The railroads cannot have too much initiative. But past exportence has shown that they may have too much competition; and the great lesson taught by the operation of the roads under Director-General McAdoo is that the great need of the future is a reasonable and wellconsidered system of cooperation.

The roads should be returned to their owners to be operated by them, subject to a certain amount of governmental control. Thus the Interestate Commerce Commiscion policy of regulation of rates should be continued; and there is much to be said in favor of the creation of a Secretary of Transportation to consider earriers' estimates of future expenditures, including abor coats; to exercise supervision over security issues; and to fix rates designed to yield revenues sufficient for future operations and credits.

The railroads, as thus privately owned and operated, abould be permitted to colperate, where the object is to eliminate duplication of service and of facilities and to secure the most efficient use of routes, terminals and cars. Moreover, under Pederal sanction, they should be free to effect consolidations which can be shown to condusive to the mutual beacht of the public and roads

The Army and Aerial Mail Service

UCH interest attaches to the successful termination of the trapscontinental flight of four
Army sirplenes at Handhurst Fleid, Long
Liland, on January 7th and the start of the return
journey to San Diego, Cal., last week. It marks the
first serious effort on the part of the Government to
gau an experience in serial overland frijing, that will
help seronauties immeasurably when it is put to commorcal and industrial uses. Primarily the flight was
undertaken to locate, photograph and aerially survey
landing fields in the more renote country of our great
Nouthwest, for the purpose of laying out possible serial
mail routes.

In its issue of December 21st, 1918, the SCINETING ARCHAEL ARCHAEL MAN ander plain the various uses to which the Government in its several departments could put the airplane, and it is encouraging to see that consideration is being given to one of the most important of those activities. If any Department of the Government is qualified to lay outs the general routing scheme, surely it is the Department of Military Acronauties with its thousands of aviators. Perhaps it can be induced to govern further and work out the problems of the Forestry Service in its Forest Fire Patrol Police, etc., for which it would be peculiarly qualified.

But without going too far afield in this discussion, we wish to record our conviction that the Oovernment should consider very seriously having the Post Office Department comploy the War Department to carry its acrial mail. Many advantages would accrus from an arrangement of this kind. First, the Post Office Department could depend upon the contractor and the contractor's ability to put a sufficiently large and experienced organisation behind the work to insure its successful accomplishment. Second, lastead of paying outside contractors for this service or maintaining an aerial force of its own, the Post Office Department would materially reduce its cost for such service, and at the same time make it possible for the Department of Military Accounties to ask for much lower appropriations from Congress for the maintenance, equipment and transing of its military photos.

The advantage of such as arrangement to our air forces is most evident. Ordinarily, to keep our military pilote is proper training and maintain their efficiency, it would be necessary that some of our largest flying fields would be necessary that some of our largest flying fields and practice of military accounties. These ould be reduced in site in the event that the Post Office Department retained their services, and they would provide many service and supply stations in various parts of the country which would add materially in the work of recruiting. Furthermore, where training was possible under actual commercial conditions, in which schedules must be maintained and discipline kept at its highest in their work than they would be in the relatively aimless flying at training schools.

Our Army has always been efficient. It built the Panama Canal when others failed. We believe it would make a success of our Aerial Mail Service!

The War's Influence on Naval Design

IT is too early as yet to predict what effect the experience gained during the war will have modifying future naval designs in a broad way. Whether it will produce radical changes in our ideal of the relative values of the various types of fighting ship, it is too early to say positively; but the present indications are that a fighting fleet will consider for many years to come, of battleships, battle-cruisers, well-armed accust ruisers, and destroyers.

Coming down to details, it is not our purpose to go elaborately into the matter just now, but rather to point out some of the leasons which apply more particularly to first-line fighting ships—that is, the dreadnought battleships and battle-oruleers.

The great increase in the length of capital ships due to the rapid development of the battle-cruiser, brings to the front the problem of atifices and longitudinal strength. During the war the British had battle-cruiser in action and on parto work, that were over 800 feet in length. The experience pained suggests that special attention must be paid to the matter of the

girder strength, or the resistance to bending str these great ships. The problem is rendered more difficult by the natural desire of the line officers who fight the ship, to have their vessel present as small a target as possible to the enemy, especially in respect to its height above the water-line. It was a matter of remark among the officers of our own fleet that when the surrendered German battleships and battle-cruise came in sight, and particularly when they came absaus they gave an impression of sitting very low in the water The battle-cruisers "Renown" and "Repulse" the same impression. This low freeboard and abs of lofty superstructures is all to the good in rendering it difficult for the enemy to score hits; but from a structural standpoint, it is all to the bad; for if we lengthen the ship without making a corresponding increase in her depth, we lose in girder depth and consequently lose enormously in girder strength-lose in fact as the square of the depth.

Closely associated with this is the tendency of late years among naval designers to fare their slape above the water line at the low, with a view to throwing the broken water away from the ship and preventing the blurring of the periscopes and gun-sight belowages. In moderate seas no harmful effect is felt from these flared hows, but when these high-speci slape are driven hard into a heavy sea, the sudden increases of the bending moments on the ship that is almost dynamic in its effect.

These conditions may be met partly by abolishing the flaring bows, thereby softening, as it were, the lifting effect of a wave, and by doubling up the plating and docks of the molded structure for a considerable distance amidships. Another method would be to carry the hull proper, one dock higher amidships.

Probably there is no more difficult task set before the naval architect than that of designing such langs vessels as our new battle-cruisers, 875 feet in langth over all and of 38 knots speed. Their draft is subject to rigid limitations, their freeboard must be kept reasonably low. Consequently, compared with a trans-Atlantic liner like the "Aquitania" or the "Leviathan," they are very shallow for their great length. Furthermore, unlike the commercial ship, their snormons loads, due to the pure of 15 or 16-inde childre with their immensely heavy barbettes, turrets, and magsaines, are concentrated at certain specified points along the ship. To this is added the anormous weight of engines and boilers us sufficient to give them their 180,000 or more horse-power.

The effect of this heavy concentration of weight and of the stresses due to the recoil of heavy guns, was shown in the case of the 32-knot ships of the "Furious" class, of great length and comparatively shoal draft, were mable to stand the recoil of the two 18-knot aguns, one forward and one aft, which were tried experimentally in the first hip of the class. The racking effect on the hull structure was such, we understand, that they were removed and 18-knot guns were substituted.

Another lesson of the war is the supreme importance of protecting the vitals of the ship against big-gun. Another lesson of the war is the supreme importance of protecting the vitals of the ship against big-gun, high-explosive shell firs. It took the satual test of hattle to show how searching is the flash of a bureting high-explosive ship of the same of a bureting high-explosive ship of the same of

Necessarily these battle-cruisers are lightly armoned compared with buttlenhips. The protective value of armor was shown by way of contrast loss, which was bestienhip of the "Guese Ellambeth" class, which was under the fire of half-a-deem German battleships at the high season of times by the held delivered as moderate ranges, she came through without with briur.

A Record of 198 Ledge was recessly established by Lieut William T. Campbell, Officer in Charge of Flying at Love Held, Dullas, Texas, with a Curties arplane, According to the Asro Chie of America, this is the Influen-cedered Lieux. Carl Batte held the previous record of 126 consecutive loops

Grossing the Highest Andes.-Lieut. Dagoberto Godoy of the Chilean army crossed the Andes at their highest point in a Bristol biplane, donated by the British deverment, on December 12th last The aviator left Santiago, Chile, and crossed the Tupungato range at an altitude of 19,700 feet, landing at Mendosa, Argentine Republic

Our Airpiane Timber.—The latest available figures dicate that more than 132,056,288 feet of first-class surplane lumber was produced in the northwest during the war, through the efforts of the spruce division of the Signal Corps These figures include production from August, 1917, when 202,264 feet were delivered, until ber, 1918, when the production reached the high

Captain René Ponck's Record -The highest official score for bringing down Hun fliers, according to Flying, goes to Captain René Fonck of the French army Befor e armistice was signed he was officially credited with 75 Boche planes, but virtually he brought down over 100 On two different occasions he brought down six machines in a few minutes Fonck was a wonderful filer and was among the first to perform the 'barrel" maneuver during an aenal battle The French Government has conferred on him nearly every decoration in its nower to mye

Airpiane Parachute Prise -- Mrs Louis Bennett, whose son, Lieut Louis Bennett of the British Air Fore tost his life while flying at the front, has offered \$500 to the Aero Club of America to be used as a prise in a contest to develop the invention of parachutes for use in escaping from airplanes which have caught on fire or got out of control The offer has been accepted, and the club has formed a committee of the following memes to organise a parachute competition Major Thomas Baldwin, A Leo Stevens, Colonel A L Fuller, Colonel Heary B Hersey, Colonel James Prentice, Lieut-Col William Thaw, Major Cushman A Rice, Congressman F H LaGuardia, Major R W Schroeder, Rear-Admiral Mark A Bristol, Commander Henry C Mustin, Commander John H Towers, Lieut Godfrey L Cabot, Lieut R A Preston, Commander P N Bellinger, Ensign Raffe Emerson, Henry Woodhouse, Frank S Lahm, and Augustus Post Although several successful types of parachutes have been employed during the great war, the relative ments of the various types have not been established, and it is for that on that the competition is to be held in the near future

The Ford of the Air -A most important developsent is the production of a low priced, most useful agdane, which is the equivalent of a Ford automobile plane, which is the equivalent of a Ford automobile This machine has been produced by the noted aeronautic engineer, Captain James V Martin In reality, Captain Martin produced this little sirplane to supply the military sed for a light fighter capable of climbing to 25,000 feet within a half hour, with two guns to fight raiding Germans, having a speed of over 100 miles an hour obtain these results he evolved new and ingenious cosain these results he evolved new and ingenious methods of construction and truesting which greatly decreased the weight and head remetance. He slice swolved a retractable chassis, which folds up like a bird folds his legs when in flight. By this one devices there is eliminated 11/100 of the total head resistance of the surplance, so that the speed is thereby increased by 11 miles an hour. The K-bar trussing reduces the head remetance through the elimination of strute and wires and permits the increase of the map and struis and whree and permits the increase of the gap and give a higher factor of selfer. The result is a very attractive little sirplane, continues Typing, equipped with 46-honespeure engine, capable of earrying two passengers et a speed of fixon 70 to 50 miles an hour. A most remarkable feature is that this sirplane will make about 32 miles we a gallon of gasoline. Having a span of early 13 feat, and weighing only 260 pounds, complete with makes, and having a landing speed of only 37 miles an hour, this plane one laid on and sicist from a diseast any country road. It is expected to call at about \$3,000

Seil Surveys in the United States —The Bureau of Soils of the U S Department of Agriculture reports that it carried out detailed soil surveys covering 38,136 square miles during the fiscal year 1918 The total area covered by such surveys up to the present time amounts to 483,961 square miles Twenty-four states and four Federal bureaus are now cooperating in the work of soil

An Official Map of Uruguay - The Geographical ownal reports that an official survey has been under-sken by the newly organized Servicio Geografico taken by Militar of Uruguay for the construction of a complete large-scale map of that republic The prime mover in this enterprise and the director of the geographic service is Colonel Silvestre Mato I he map is to be published on two scales, 1/100,000 and 1/25,000, and will not be complete for many years

An Immense Fund for Medical Research According to Science, the will of the late Captain J R De Lamar, mine owner and capitalist, leaves nearly half his \$20,000,000 estate, in equal shares to the Harvard Medical School, Johns Hopkins University and the College of Physicians and Surgeons of Columbia University for use in medical research and the dissemination of medical knowledge. The rest of the estate is left in trust to his daughter, with the provision that if she dies without usue the principal is to go to the institutions shove named

Density of Sodium Chloride Solutions -The U S Bureau of Standards has recently made a numb density determinations on samples of sea water and other sodium chloride solutions The data thus obtained, it is stated, will be of use to occanographers The Bureau has also prepared samples of sedum chloride solutions of various concentrations in connection with an investigation of the density-concentration relation and for the purpose of establishing a percentage scale for salt solutions for use in the manufacture of hydrometers to be used in the pickling industry

The Journal of Geography, heretofore published under the editorship of Prof R H Whitbeck at the University of Wisconsin, has been taken over by the American Geographical Society and will hereafter be published in New York | I his interesting journal is asued chiefly for the benefit of teachers of geography in the elementary, secondary and normal schools, and does not compete with the Geographical Review the chief organ of the American Geographical Society*and the American equivalent of the Royal Geographical Bociety's Geographical Journal

A Uniform Type for the Blind -American libraries for the blind are rejoicing over the fact that they will no longer be obliged to have books in five different kinds of raised letters in order to accommodate readers taught in different parts of the country and at different periods After many years of discussion a uniform type, to be known as 'revised Braile, has been agreed upon, and hereafter all books embossed in this country are to be in the new type "The Deserter by Richard Harding Davis, was the first book to be published in revised

Reports of Snow on Highways .- In the winter of 1917-18, the Weather Bureau in cooperation with the State Highway Commission of Pennsylvania, inaugurated a system of reports on the depth of snow at various system of reports on the unput of the system of reports on the Lincoln Highway between Harrisburg and Pittsburgh. The reports were made by the as superintendents of highways to the Weather B station at Pittsburgh, where they were bulletine station at Pittsburgh, where they were buildings as diffurnabled to the press, as well as to automobile clips and motor-track associations. The Weather Bureau also sured warnings of heavy snow for the mountain regions of Penncylvania, so that stops might be taken to keep the roads open. This winter a mular service has been started in parts of New York and New Jersey, and the system will guidably become more general, in connection with the concerted efforts that are being made by that being you commission, the Motor, Transport Servers of the Council of #stim Defense and the automorphic discissions to keep the main highway open during the susceptible of the Council of the susceptible of the control of the council of the c used as motor-truck, rural express and parcel-post

Automobile

Starting in Cold Weather On cold winter days and with the heavy gasoline now used, it is sometimes difficult to start the engine. If there is illuminating gas in the garage a quick and easy start can be made by slipping a rubber tube onto the gas jet and putting the other end into the air intake of the carburetor gasoline should not be turned on nor the carburetor looded, before the engine has warmed up

Tanks Converted into Farm Tractors -The little lightweight Renault tanks established an enviable reputation as fighting machines during the last year of the war, and now in times of peace they promise to become equally useful Already some of them have been converted into agricultural tractors by the removal of the guns and armor and a few other shight modifications, and are said to be doing excellent service on the farms of France, where labor is painfully scarce just now Another, and probably temporary use that has been found for them is towing barges on canals taking the place of horses

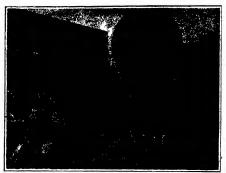
Lubricating the Car -An important direction in which we may hope to see material improvement in the near future is in the methods of lubricating automobiles It is said that on some cars there are as many as 74 points where some sort of lubricant must be ap-Many of these are entirely maccessible and there is but little doubt many of these points are never discovered by the amateur owner who cares for his own car A few years ago a car was braight over from the other side that contained a most inconous and apparently efficient lubricating system in which there were but a very few points for the application of the labricants and these were all in plain sight and casy to get at but as this car did not gain a foothold here its good features attracted but little attention Now the matter is apparently being taken up by some of our manufac turers, and it is to be hoped that a much needed wform will result

Oil vs Grease -Oil has always been a popular medium for lubricating the many wearing parts of the chassis because it was so easy to apply, and the fact is overlooked that oil will run out of a bearing just as easily as it will run in, and consequently constant attention is necessary to maintain proper lubrication Indied, this is only possible with a forced feed system which is not practical for the character of the bearings in the ordinary chassis On the other hand, while grease is not so convenient to put into the cups it can be fed under ressure, to most of the bearings thus insuring a more perfect film of lubroant in the bearing and one of a character that will survive much better under heavy loads Another good feature of grease as a lubricant is one that many an old time bicycle rider appropriated With oil in a bearing there is a pumping action that tends to suck grit into the bearing while with grease there is no such action the grease always tending to work outward, thus not only scaling and keeping grit from gaming access to the hearing, but also tendin excrete any foreign matter that might have got in by some other way

Cheap Fuel -The search for a fuel that will be cheaper than gasoline, and equally as efficient, appears to be about as clusive as that for perpetual motion and so far appears to have many of the same characteristics Tests of the latest widely heralded fuel, which appear to be only a mixture having benzol as a base, do not seem to bear out the claims made for it, and, indeed, similar mixtures have been experimented with for at least five years in England without any very practical results Undoubtedly benzol either alone or combined with other inflammable liquids that can be vaporised or properly atomised, will form a valuable addition to our fuel supplies, but there is little probability that these compounds will supplant gasoline be far little bensol has been used, as most of the supply has been required in the manufacture of explosives and its future application will depend largely on the quantities in which it will be produced more that war demands are diminishing In a sense beneal us a by-product, and as such but little attention was given to saving it before the war except in Germany, but the experiences of late have warned us the world cannot tolerate waste and it is hoped that greater quantities of this undoubtedly valuable motor







Pushball is a favorite sport at some camps

How Uncle Sam Has Created an Army of Athletes

Training Camp Activities Which Worked Wonders in Permanent Physical Betterment of the Drafted Men

Now that the great war is over to all intents and N purposes it is interesting to reflect on what it has done for the vast body of ivilians who a year and a half done for the vast by by a svalans who a year and a half ago began to flow into our in this altraity sumps. We have had in Lurope at 1 in the camps of the country approximately 400 000 me in 1 in it as a to pr due that the great majority i three will be benefitied for the rest of their bives by the course i intensive training through which they were jut. In other words Unite Sam retail in not only an arm of sol here but an army of athrees. These men are in infinitely better physical condition than they ever would have be in it a probation of the properties of the p

the most of them will make an earliest control of mains and the perhaps natural to think that with drilling and other taxing tasks of the sol hier athletics would be a superfluous commodity in camp. On the contrary it has been found that the more the mon were nursed to the vigorous use of their bodies the m re th y longed for competitive games and tests of strength. It is a known fact that men relieved from duty in the first line trenches turn instinctively to strenuous games like football to gain the healthy equilibrium ne ossary to

From experience too it has been learned that an instantaneous muscular control is owential in the success of the fighter. For two military rasons—I) develop the lighting institut and to arm that instin t with control—there has been carried out a program of stilictus unralleled in history

Uncle Sam considered athletics of the hard competitive sort that develops the fighting instinct of such importance that in the very beginning he summoned to his aid the very best talent the country possessed Some forty men among them many famous coaches wer assigned as sports directors in the several training enips Organiz-

ing and directing the athletic activities of 40 000 men and maintaining an athletic pro gram that will encourage the argest possible number of soldiers to participate regu larly in some form of ath letics during their lessure is certainly a man s size job But the reactions are remark able Football, baseball basketball soccer boxing wreetling tennis track and field athletics and all forms of winter sports were in dulged in by all the men in training Never before in the history of this country have so large a number of men engaged in athletics never before has physical welfare received such a stim-ulus Narrow-chested clerks made three base hits on the same ball teams with college athlites and lean-vuaged philosophers learned how to use their fists The book-zeoper and the street-car motorman came to grips on the football field Men



Tennis champions instructing the jackies in fine points of the game

learned to get bumped, and not to mind it of persistence was developed. Being attached to division headquarters the division at heits director was able to coordinate his plans for

inter-company and inter regimental baseball or basketinter-company and inter-regimental baseball or baskershall leagues trake events field days and the like, with the military routine of the different companies. He kept in touch with soldiers who naturally lead in athleties and attempted to stimulate the sporting eloment of their companies by the formation of a Divisional Athletic council the members of which were in turn elected by the regimental councils in the latter case such company had its roperaticatives and own athletic or make the council to the presentatives and own athletic or make the council to make the council of the counc things hum in an athletic way at any time and to stimu-late the interest of the men of all the companies in eamp

late the untrove of the men of all the companies in samp. The sports induded in the ramp curriculum such as boxing football and other personal-contact games were selected primarily to prepare the men for the struggle to come and the value of the athletic training they received was fully realized as they went over the top authorities considered that boxing had great value in developing in the individual man the sense of confidence and aggreenviewes that is generally desirable in a solder, while it gives better than any other form of training a sound foundation for modern beyonet-fighting. Boxing and femits are employed the men learn to be quick on their feet. Nor as the mixely theoretical. The Canad in troops who have been at the front report that the aghity and quickness of eye gamed in boxing is a valuable part of the solders exquiring

aphity and quickness of eye gained in bouing as a valuable part of the solders a equipment. Detailed groups of mea who had had previous knowledge of this aport were trained by the boxing instructors to become their assistants. These boxing instructors by the way. have included some world's champion publists. In many camps from the hundred to four hundred evaluant boxing instructors were developed and gave instruction

The growth of the popularity of boxing from a more

siarity of boxing from a more or less forbidden sport to one adopted by the American army was one of the marvels of the war Moreover, the soldiers were rable faus (amp bosits were frequent, even the Y M C A encouraged them, and made them a regular feature of the avanuar moreovers. evening programs in the hute' Last summer 40,600 khaki-clad soldiers and half as many orvilians were spectators in a huge natural amputhentre at a series of bouts between teams representing the 86th di-vision, Camp Grant, and Canadian troops

It as a unique fact that Camp Grant was the only camp in the country where series of bouts between teas



A toboggan of solid snew 35 feet high built by the boys at Camp Grant

utilise the heavy snowfall and cold weather of last winter for winter sports. Six toboggan slides were in daily us and 50 toboggans were at the disposal of the men. dition, 200 pairs of skis and 150 pairs of snow shoes are distributed, while six artificial skating rinks and sen hockey sticks were provide

At Camp Grant use was made of the Brigade organi-At Camp Grant use was made of the Brigate organi-sations as a clearing house for the distribution of equip-ment. Companies desiring to use any of the equipment would get it from the Brigade Athletic Officer and, after ng it, return it for the use of the next organisation. Thus several different groups were enabled to use the same apparatus in one day. According to Captain Lowis Omer, Athletic Director at Camp Grant and formerly director of athletics at Northwestern University, th winter sports proved most efficacious in neutralising the bad effects of the super-heated air of the barracks with its enervating influence. The greatest enemy to the

reason compulsory exercise of the play variety in the open air was instituted at Camp Grant, one hour a day being devoted to this

Camp Grant was also the first to put eross-country running into the scheme of mass athletic training. In the 183d Brigade weekly cross-country runs were held and the men brought to a point where they could run two and one-half miles in sero weather without any bad after-effects. In the middle of January approximately

sero weather without any had inter-direct.
In the middle of Jasauary approximately.
The plan for developing cross-country running used at this camp was later put into effect in other camps.

As was to be expected, baseball proved to be the most popular of the summer sports. Every camp was provided with an immesse field to be used as a parade ground, and, what is more escential, an athletic field. Some of those in the National Army cantomounts were had been appropriated to the summer sports. The summer sports are provided with an immesse field to be used as a parade ground, and, what is more escential, an athletic field. Some of those in the National Army cantomounts were had been supported by the summer sport of the

to purchasing athletic equipment for the two camps and is purchasing athletic equipment for the two samps and for the hoys already in France. The Government provided each company with a certain amount of athletic equipment—about 75 cents a man, which was not enough—but the men in many cares bought some things out of the row money, while every company had an "athletic elect" which they took to France with them. The Y. M. C. A. also made a heavy investment in base-balls, hats and gloves, baselvhalls, medicine halls, boxing gloves and wrestling man; every—"hut" was well progress and wrestling man; every—"hut" was well protected for a "catch" or a set-to in other games. Not only were all of the well-known games, such as basketball, playground ball, volley ball, football, etc., played at the average camp, but frequently the division

played at the average camp, but frequently the division



ngover tricked into denying that he hears, when the destay can array that he doon hear

athletic directors invented new games. And one phase of camp athletics, which is hardly touched upon by the colleges, was laughter-compelling games. This was imornings, was intigrier-companing games. In was im-portant, for good humor is one of the vital elements of discipline. The games were popular, too. In addition to numerous improvinations, leap-froe, prisoners'-base and a dosen other games that even school boys have outgrown, afforded the men intense enjoymant, and served the additional purpose of promoting good feeling and developing self-control, agility, mental alertness and initiative, all bases on which to build military efficiency.

Doctor vs. Malingerer

IT was an observation of the ancients that the greater pain obscures the less and that, in a general way, strong sensations prevent the appreciation of weaker ones. In precise terms, stumuli that are similar in all their properties except intensity are not dissociated by the mind, only the stimulus of greater intensity being so



One of the indoor sports upon which the men fall back in had weather

registered that we are conscious of it. This law was utilised with much success by Dr. John F. Callahan of Brockton, Mass., in the detection of malingerers who sought to evade the draft by false claims of deafness in

one ear—a common practice

When a sound reaches each car with the same intensity we are conscious of hearing it in both. When it reache each ear with different intensities we are conscious of hearing it only in the ear where intensity is the greater. Thus tuning forks vibrating with the same pitch and loudness one inch from each car are heard in both ears; but if the fork at the left ear is removed to a point three DUL II the lork at the left ear is removed to a point targe inches away this sound is itsel and only the fork remaining at the right ear is heard. But if now, the latter is put six inches back, it will an longer be heard, while the loft one, formerly not sensed, will become audible. Dr. Callaham early convinced innessif that tests which

depend upon the suspected malingerer not knowing in which ear he hears the test sounds are an insult to his which ear he hears the test sounds are an insult to his intelligence; the patient can successfully communitate his attention on his good ear and suppress what he hears in his supposedly bad ear. The most we could here expect would be to trick a patient who was not very sharp; and even then we could merely ascertain that he was not totally deal in his "had" one—we could near determine the extent of hearing he had in that ear. So Dr. Callahan has worked out a procedure where the patient knows which ear does the hearing, but where he is betrayed by his ignorance of which one ought to do it if his claims were correct.

The sound is brought to the patient's ears through rubber tubes. It is necessary to eliminate the poss-bility of bone conduction, since the vibration in the tube s can often be felt with the hand So instead of being attached to the patient's head with lugs, the tube-ends

attacked to the patient's head with lugs, the tube-ends terminate in a surred arm attached to the chair-top; and after the patient is seated, these ends are brought to within an inch of his either ear, without any contact between him and the appearatus. The sound may be produced in various ways. Dr. Callahan has used tuning forks, and a megaphone manufactured from an old ether cone. In the foremer case, the desired length of tube is got by a metal clip joining the two tubes, which at the same time makes it possible to use a single fork; and hiji-parts of the tubes beyond the lig simply do not figure in the test. In the wood test, where the cone has actually to be at the physical end of beth tubes, metal couplings and auxiliary tube-lengths beth tubes, metal couplings and auxiliary tube-lengths are used. In either event, the mechanical details are

efficiently obvieus.

If the patient has two good cars, when the tubes are

of the same length he will hear the sound in both ears. There will be a neutral sone of two or three inches around this point in which the same result will be obtained inute either tube becomes appreciably longer than the other, audibility will be confined to the our that ins to the shorter segment.

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If the patient really has a bad ear, each ear will have en tested separately; it will be found, say, that he hears in his good ear up to 20 feet, and in his bad ear up to 3 feet. With both tubes in use at the same time, he will hear the sound in his good car whenever the length of the tube leading to it is less than 20 feet while that of the tube leading to the bad ear is greater than 3 feet. The minute we get his bad ear within 3 feet of the sound while the good car is 20 feet or more away, he will hear in the bad ear. And proceeding from this point to move the sound nearer to both cars at once, if it is 6 inches from the bad ear and 18 feet from the good one, the intensity of audition will be greater in the bad ear. The patient

will then hear in the bad car, and the good one will register no sound-although if bad ear were closed, he would hear in the good one.

good one.

Suppose now that a malingerer has claimed deafness in his left ear. If he claims partial deafness he will be tripped up in short order by sounds whose intensitics and distances are not known to him; so realizing this, he claims total deafness in the ear in question. He must then go into the test with the determination to say no whenever he hears a sound in his left car; otherwise he will presently admit hearing something which he should not hear. Very well; in the case outlined in the preceding paragraph, he hears the sound in his had our, and denow hearing it at all. Then he is caught; for if his left ear were deaf he would liear it in his right, and if his left ear would hear it in his right, and if his left ear were not deaf he would hear it in his left. Of course the distances in the above suppositious case will be greatly modified according to the facts of each case. every case there will be a region where the malingerer hears the sound in his "bad" ear, so that he must deny hearing it at all,

yet in which he could hear it with one ear or the other if his claims were true. Thus, suppose he really hears at 30 feet in his left car and at 20 feet in his right, and has claimed deafness in his right ear. When the tubes are so adjusted that the source of sound is 10 feet from his left ear and 6 feet from his right, he will deny hear-

ing at all!
In every case the range of the good car can be deter-In every case the range of the good ent can be determined in advance by separate twist of the two cars; and in every case the patient, by his negative answer, unconsciously gives exact information as to just what degree of hearing he has in his alleged had ear. For as degree of nearing ne has in me nieged nad ear. For as the sound-source retreats firm the good ear and ap-proaches the bad one, he marks the point at which he begins to hear it in his bad ear by changing his claim from "hear" to "do not hear." There seems no escape for "hear" to "do not hear." There seems no escape for the unfortunate victim of Dr. Callahan's ingenious de--except that of telling the truth about his hearing to begin with.



A suspected malingerer, who claims one deaf car, tested with a tuning lark instead of the voice

The Principles of Camouflage—II

Low Visibility and Optical Illusion on the Sea By M. Luckiesh

Al the time of the Spanish American War our battle ships were painted white apparently with little thought of attaining low visibility. Later the so-called thought of attaining low visibility. Laker tin securing that the property of the first page and to close observers that this gray is in general too dark Apparently it is a mixtum of black and white. I has ships of the British navy were at one time painted black but preceding the Great War their coats were of a warm preceding the Great war that contact with the ward dark gray Germany adopted dark gray in fore the close of the last century and Austria Lipited the German gray at the outbreak of the war. The I reach and Italian gray at the outbreak of the war. The rean and radian fleets were also paintful a warm gray. This develop-ment toward gray was the result of an aim toward at-taining low visibility. Other changes were necessitated by submarine warfare which will be hiscussed later.

by submarine wariant which will be inscussed later it the early days of unristricted submarine warfare many schemes of modifying the appearant of vossels were submitted. Most of these were incredy wild fanoise were submitted. main senomes of modifying the appearance of vessels were submitted Moret of these were incredy wild fanous with no established reasoning behind them Here again senenc came to the reason and through research and consultation hally straightened out matters and consultation healty straightened out matters are lequestion of low visibility for vessels could be the oughly studied on a laboratory scale because the seaseape and natural lighting conditions could be reproduced very closely I wen the gueral weather conditions could be amulated although of course the experiments could be prosecuted outdoors with small models as in deed they were Dr I A Jones carried out an in vestigation on the shore of I ake Ontario and laboratory vocupation on the snort of I ako Ontario and laboratory experiments were conducted by others with the result that much light was shi i on the questions of marine camonifing. I his work confirmed the conclusion of the writer and others that our battle ship gray was for dark. Of course the golds that

was too dark Of course the color best adapted is that which is the best com promise for the others warrely in lighting and weather conditions. These vary in different parts of the world so naturally those in the war sone were of primary importance. All camouflage generally must aim to be a compromise best suited. am to be a compromes ose suiter to average or dominating conditions. For example in foggy weather a certain paint may render a ship of low visibility but on a sunny day the ship might be plainly visible. However if ships are rendered of low visibility for even a portion of the time low visionity for even a portion of the time it is obvious that an advantage has been gained Cloudiness increases generally from the equator northward as indicated by meteorological annals

A Scale of Visibility

In order to study low vasibility a scale of visibility must be established and it is cosenulat to begin with the fundamentals of vision. We distinguish objects by contrasts in brightness and in color and we recognise objects by these centuates which mold their forms. In researches in vision it is customary to devise methods by which these contrasts can be varied. This is done by increasing or decreasing a veil of luminosity over the object and its surroundings and by other means Much work bas surroundings and by other means made work has been done in past years in studying the minimum perceptible contrast and it has been found to vary with hue, with the magnitude of brightness and with the size of the image that is with the distance of an object of given use. In such problems as the one much sesentials over can be drawn upon. A simple though rough each of variability may be made by using a scrise of photographic screens of different densities. A photographic screen is slightly diffusing still the object can be viewed through it very well. Such methods have been employed by various investigators in the study of visibility. Owing to the curvature of the earth the distance at which a vessel can be seen on a clear day is limited by the highly of the observer and of the ship is upparticularly form an observer in a cortain position the visibility range with the contract of the con

varies as the square root of the distance of the object from M. Such data are casily available so they will not be given here. So far we have considered the ship itself when as a matter of fact on clear days the smoot cloud emitted by the ship is usually vasible long before a single superstructure appears over the horizon. This led to the prevention of smoke by better combustion, by using smokedes fuch, etc.

The irregular skyline of a ship is perhaps one of the most influential factors which tend to increase its visibility. Many suggestions pertaining to the modifica-

tion of the superstructure have been made but these are generally impracticable. False work suffers in heavy sens and high winds

Countershading to Ingrease "Low Visibility"

After adopting dark gray as a low-visibility paint for ships perhaps the next refinement was countershading. that is shadows were painted a lighter color or even white The superstructure was painted in some cases a light blue with the hope that it would fade into the light blue with the hope that it would fade into the datant horizon. However, the effectiveness of the submarine domaided now expedients because within its range of effectiveness no ingenuity could reader its prey invasible. The effective gunfire from submarines is several miles and torpedoes can be effective at these datances. However the submarine priors to discharge the torpedo at ranges within a mile. It is obvious that in average weather low winbility cased to be very effective against the submarine. The movement of a target is of much less importance in the case of gunfire than in the case of the torpedo with its relatively low velocity The submarine guiner must have the position range and course of the target in order to fire a torpedo with any bope of a ht. I herefore any un-certainties that could be introduced pertaining to these factors would be to the advantage of the submarines prey. For example low visibility gave way to con-tumbility in the discussions of defones againt the sub-marine and the slogan, "A mass is as good as a mile" was adopted. None of the foregoing factors can be determined with high accuracy so that it appeared possible to add somewhat to the difficulties

THE art of deception in war is as old as war itself, but never has it I received such close scientific admition as in the mighty struggle the world has just passed through Early in the war it became evident that while natiti might deceive the naked human sys, the deception would be perfectly transparent to the photographic camera. A complete humahele of the composition of color was importable. Here the service of the physicist had to be called in Not only was color used to boodwink the sureny but all manuers of optical illusions, here also the physicist was needed. And so many prominent scientists were enlisted to reduce camouflage to a science.

Among the physicists who had contributed to the scientific development of comediage was the author of the present article, who is a well known color expert. In Luckish, therefore, writes with authority. He start installment, dealing with comouflage on land, was published in the SCIENTIFIC AMERICAN of January 25 1919. The third and last installment, with well be published in a vary tesses, will deal with installating of sirplanes —EDITOR.

Optical Illusions to Distort the Lines of a Ship

Many ontical illusions have been devised and studied by scientists In fact, some of these tricks are well known to the general reader Straight lines may appear known to the general reader Straght luess may appear proken, convergent, or divergent by providing certain patterns or lines intermingfed with them. Many of these were applied to models in absoratory experiments and it has been shown that continuous results as to the course of the vessel. The application of these on vessels has resulted in the groteque patterns to be seen on stips. It is well known that these illusions are most ships it is well known that these littiatings are most offective when the greatest contrasts are used, hence black and white patterns are common. Color has not been utilized to any appreciable extent in confusibility although there is a secondary aim of obtaining low although there is a secondary aim of obtaining low vanishity at a great distance by properly balanoing the black white and other colors so that a blue gray results at distances too great for the individual patterns to be received by the eye Color could be used for the purpose of increasing the confusion by apparently alterns the perspective For example, blue and red patterns on the same surface do not usually spepar at the same distance, the red appearing closes than the blue that the surface of the same control of the color of the the loss of the alternative the same than the colors the hose of the alternative the same than the properties by which we estimate the course This was the final type of commontance at the older of the war. Bealeds relying

which we estimate the course. This was the final type of camouflage at the close of the war. Besides relying upon these illusions, ships signsigned on being attacked and aimed in other ways to confuse the comp. Little attempt was made to disguise the bow because the bow wave was generally visible. However, attempts have been made to increase it apparently and even to provide

one at the stern. In fact, ingenuity was heavily drawn upon and every plausable expedient has been tried. The convoy system is well known to the reader. Thus saved many vessels from destruction. Vessels of

The convoy system is well known to be resource. This saved many received from destruction. Yearch of the same speed were grouped together and established floors across the Altendard of the same speed were grouped together and established floors are the Altendard of the same speed o during the submarine meance

Naturally smoke screens were adopted as a defensive measure on sea as well as on land Many types of smoke boxes have been devised or suggested. The smoke is produced obemically and the apparatus must be simple and asfe I is merchanium were attacked by a submarine immediately smoke-boxes would be dumped overboard or some which were installed on deck would be

overboard or some which were installed on deck would be used to be used in a signag course. These expedients were likely to render shell fire and observations inaccurate. This mode of defense is best suited to unarmed or inferiorly armed vessels.

Camouflage for Submer

So far as the writer has been informed no attempts have been made to camounting submarines under water but that this can be done is evident from aerial observations. When looking over the water from a point not far above it we are unable to see into the water except as points near us where our direction of vision is not very oblique to the surface of the water. The brightness of the sur-face of water is due to mirrored sky and clouds ordinarily For a perfectly smooth surface of water the reflection factor is surrises of water the renection factor is two per cent for perpendicular medicace. This increases only slightly as the obli-quity increases to an angle of about 69 degrees. From this point the reflection

quity increases to an angle of about 80 grees. From this point the reflection factor rapidly increases, becoming 100 per cent at 90 degrees incidence. This accounts for the case with which we can see into waters from a position directly overhead and hance the airplane has been an effective hunter of submarines which the second water of the seed at which an object can be seen water of ourse depends upon the clarity It may be compared to the seen water of the seed of the seen water of the seen water of the seed of the seed of the seen water of the seed o hues and reflection factors of earth and water areas it would be easy to camonifies submarines effectively from ensemes overhead. The variability of submarines it amplified by vewing large fish such as sharing from airships at low altitudes. They appear as ministure submarines, dark gray or almost black smile greening bilus surroundings. Incodentally the color of water varies connectarably from the shallow island waters containing much suspended matter to the deep olear cosms without the submarines. Cell the submarines containing much suspended matter to the deep olear cosms without the brightness of the former under the panne such ditions and are decidedly bilus raliand waters such as the Chesapeake Bay are very greenish in color.

Worlds of Four Dimensions

A Field of Mathematics Equally Interesting to Student and Layman

Fishs infinite variety of topics to be found in mathe-public appeal. The enterpola statement of the mathe-matical that the carde cannot be squared or the cube couplisated or the angle traced under the rules which he has lead down to govern stack upon three problems always irritagues the lay mind. And in the same way as imposed to the coupling of the coupling of the same description of the coupling of the same description and the coupling of once is the most casual mention of the fourth dimension and four mutually perpendicular lines through a point. For here are phrases which convey a meaning to him, and moreover a meaning that seems to contradict all his appariences, so he feels that he must stay with them asperiences, so he feels that he must stay with them choording to has type of mind he will stay to seed or stay to learn, but he will stay we have yet to meet a person of includence who was not sufficiently attracted by the term "fourth dimension and the things it suggested to want to hear more about it Many of the readers of the Scientric American will result the price somptition of nearly ten years ago for onesys explaining what mathematicans mean whom they speak of the fourth dimension. The number of consequences of the stay of the stay

stants was so large, and the collateral interest so widespread, that publication in book form of a few of the etter of the essays seemed worth while It turned out to be so well worth while that the edition was exhausted Do so well worth while task the doilion was exhibited and the book has been out of print for some time. A new action has recently come from the press, and its peruals by one who had not previously seen the book is responsible for these remarks. The volume contains, in addition to the prise-winning easily and a brief afterword thereto 20 of the computing season and a brief afterword thereto. 20 of the computing

cessay and a brief afterword thereto 20 of the compoting cessays selected purely with a view to presenting as many sepects of the subject as possible, and a comprehensive and well-excusted introduction by Dr. Manning of Brown University, one of the judges in the competition at wax to be expected, the sees judge in the competition and almost unanimously upon the better-known features of four-dimensionality.

The natural passage to four dimensions by considering in order point, line, plane solid and hyper-solid is found in most of the seasy as in a great deal is said about flatiants and worlds of our. Immunous Even in this satcher hackeyed field however we find a wide choose of illustrators, and particularly pleasing is the variety of the arguments offers in inconnectation of the number of points, lines, pluse and three-spaces necessary to defaunt the tessenate or hyper cube in four dimensional configurations.

The usual amount of space is devoted to the tricks of the fourth dimension—the ponetration of closed com-partments the appearance and disappearance from three space, the interchange letween symmetric forms the turning inside out and the unraveling of knots without disturbing the ends—although in several cases it is necessary for Dr Mannin, to interpose the weight of his authority between the in lividual contributors and the errors so commonly found in discussions of these

A point which will be r w t some of those interested in hyper-space is the fut that cert un chemical isomers appear to differ only in that their molecules or crystals appear to differ only in the term more discountries and armmetroally instead in the term of the free passage from the one form to the other vilutions of manufestation of emical change and with sit collition or consumption of heat An explanation of such changes—though hardly the only explanation a some of the essayists assert —would be found in the hyl thesis of rotation through the fourth dimension. Now of those who advance this possibility makes the rather obvious suggestion that if our space has an infinitesimal thickness in the direction our space has an inflatteninal thickness in the direction of a fourth dimension and if p neitration in that direc-tion be physically impossible value to the extent of that blukkness, the occurrence of s1 is rotations only in the inflatteninal would be accounted for Perhaps the most notice within of the unfamiliar ideas

advanced in this little boil is that which suggests that we visualize time as a fourth dimension and consider bodily growth, observed at a series of different stages, as a series of cross sections t ken across the fourth dimension. Such a group of trees as the geometer would doubtless permit us to call them perhaps com

would doubtless pormit us to cit ities perhaps comes as close to actual realization of a fourth dimension in our world of points as we can hope to come But why confine the decision to a world of points? It has always seemed to us that the doctrine of hyperidimensionalized yaffers a distant loss through such confinement. It is true that we humanis conceive of married and amounted as a manifold of points. The very fact that we work that the contraction of the very fact that we humanis conceive of our surverse as a manifold of points. do so conceive however in conjunction with the fact. that the universe of our perceptions is indulitably three-dimensional in points suggests strongly that light would be thrown upon the concept of four-dimen sional manifold of points by the construction and consideration of four-dimensional manifolds of other

Our own familiar three-space is four dimensional in lines and if it is unnatural for us to think of the line as the element of which space is constituted, we can at least the element of which space is constituted, we can at rast of force ourselve's to do y and then a mit the slightlest a prace reason for not dying see our space is fur dimensional in sphere, and actually say dimensional in circles. These of us who has heard Dr. Keyser talk or who have rere il his seasy on the super (of mathematics or who have rere il his easy on the super(of mathematics). will realize well that mathematically, the point as the space element is purely an accident and that even so complicated an element as a pencil of lines is by no means unthinkable

In several places notably in the introduction 'The Fourth Dimension Simply Explained has a good deal to say of the sort of non-Fuchdean geometries got by imposing upon Fuelid's point-element siternative sets of postulates. These systems in itself throw light upon hyper-space and hyper-dimensionality but we do not see that they throw marly so much light as this other see that they throw means so much ugan as this concr sort of non-Fuchidean geometry got by imposing the Euclidean or Lobatchevskian or Rumannian postulates upon a set of elements other than points. Our one regret in leaving this absorbing volume, is that it has nothing to say under this head

Correspondence

The editors are not responsible for statements to in the correspondence column Anonymous commu alestions cannot be considered but the names of cor respondents will be withheld when so desired

A Strong and Adequate Navy

To the Editor of the SCIENTIFIC AMBRICAN
I am greatly pleased at the attitude of the article
by Mr Hudson Maxim in your uses of January 4th as
to increasing the size of our Navy I am onthussantle
about manufacturing a strong and assenguate array. The
thickness of the size of the size of the size of the size of the
thickness of the size of the size of the size of the
thickness of the size of the size of the size of the
tenager than that of any other naval power, except
England, and, remembering that Germany's strength
of England I cannot agree with Admiral Badger and
the New York Times (January 12th) that now is the time
to appead up and take first place
To understand the magnitude of that proposed expassion one has only to look at the figures comparing
hava's tomage buitt and building, as shown in our
official Navy Year Book (1916, the latest issue, p. 646,
insect) To the Editor of the SCIENTIFIC AMERICAN

official Navy Year Book (1926), the mean same, p. 648, insert, seed. 27,127,850 cm, built and building. Harmany—1,120,4890 tons, built and building. Emplained, in her increased "geographical situation, bordended "geographical situation, bordended the her increased "geographical situation, bordended the her increased and the same and the same

in naval expansion at this time especially as some of those now urging, thought before the war that third or fourth place was pleuty good enough for this country the richest nation on earth. We then carried a national We then carried a national lollars We shall soon carry debt of about one billion dollars. We shall soon carl a national debt of over twenty billions. How can the demand that we pour out the unstinted money that such a program will call for? As a very clear-headed old sea dog the admiral commandant of the Brooklyn Navy Yard said to the Naval (omnittee of Congress in m) 'A naval officer has been trained to spend

money not to save it

It is my belief that a navy of equal tennage would cost the United States at least 20 per cent over England owing to our higher wage scale and more extravagant navel management (for example our maintenance of political or sectional but absolutely unnecessary navy yards)

How much easier it would be with this enormous debt staring us in the fact for Congress simply to make adequate provision for the fundamentals-dr battle-cruisers and destrovers-of a reasonable navy, and to slow down on all other construction to the lowest cossible firmit, building only enough submarines and hydroplanes fully to stimulate invention and in provement, no more They should put saide the idea that a navy, to be efficient must man and maintain every naval vessel and burn coal or oil under every naval

After all our troops are brought home, the obsolete attleships of the second line could be put "in ordinary" battleships of the second line could be put "in ordinary" in the fresh water basin at League Island Yard, together with all obsolets crusers destroyers, submarines, and other naval orale. With only the modern up-to-date ships, built and building in active commission, we would still have a Navy that every loyal American could

be proud of, both as to efficiency and economy
Persals me to congratulate you on Mr Maxim's
splendid and sensible article

Gase, A Love Lx Member of Congress

P. 6 -- I served 11 years on Naval Committee and one year on Merchant Marine and Fisheries I served also in Dewey's first at Battle of Manila

The Transatlantic Airplane Hoax

To the Editor of the SCIENTIFIC AMERICAN There has been so much printed recently indicating that the successful transatlantic airplane flight is a thing of the future though one looked forward to with great expectations that I beg to quote the following from the correspondence column of the San Francisco Chronicle of December 22d, bearing the signature E W B. Berkeley Cal

the information of A W ('For the information of A W (Grass Valley whose inquiry regarding the crossing of the Atlantia by an airship appeared this morning please be informed that such a flight was made July 28th 28th, 1918 to celebrate the birthday of Mr Allou E Hawley, president celebrate the brithday of Mr. Allon R. Hawirey, president of the Aero Club of America. The start was made from Harbor Grace. Newfoundhand at 4 02 P. M. (seven hours, two muutes, Greenwich mean time). Sunday, July 28th and the landing at Dingle Bay Ireland, at 412 P. M. (seven hours, twelve minutic Greenwich mean time). Monday, time 24 hours 10 minutes. For an interesting description and anygators log of this flight, see United States. Naval Institute Proceedings, Vol. 44 M. No. 187. Seatomber, 100. Vol 44, No 187, September 1918

I am a close reader each week and have been for a great many years of your publication but I am unable to recall that your columns have recorded the fact that the Atlantic has already been successfully crossed by a flying machine Assuming that the subject matter of this communication interests a large number of your readers, would you not at your convenience reproduce this communication in your columns and advise whether vou can confirm?

JOHN S INCLIS

San Francisco, Cal

(The flight to which this correspondent refers was a fictitious one The yarn first appeared in Flying and was reprinted presumably on the ground of its historic interest, in the Naval Proceedings. We do not know whether it was originally intended as a hoar or whether it was assumed that readers would recognise that the account was purely fiction. Judging from the number of letters which we have received and of which the obser is but a sample, we should say that the omission clearly to state the fictitious character of the original publication and of the reprint was an unfortunate one—The Liston



Model airpiane in position to display pitch (left) roll (center) and yaw (right) when blown upon from the opening in the background. In each case L represents the assertacle lens which admits light to the chamber, and A-A the pencil of light which is deflected to a scale on the roof and there records the oscillations of the plane

The Instability of American Airplanes

Sources of the Defects That Have Killed Many Pilots Revealed by Experiments That Reduce Aerodynamics to the Elementals By W. H. Ballou, Sc D

TITHING the Hodgkins find for the advancement of science of which the Smithsonian In-stitution at Washington is custodian infersive investiga-tions have been mado at the Massachusetty Institute of Technology Boston on the dynamical stability of American airplanes together with the wind tunnel experi American airplanck together with the wind tuined experiments in aerodynamics. He investigators comprised Assistant Naval Constructor Irome (U.S.N. Capitain V. E. Clark U.S.A. C. I. Brand T. H. Huff D. W. Douiglas II. K. Chow. F. Buckingham H. F. Rossell and F. B. Wilson Bach-lors and Masters.

The technical reports rendered by those competent investigators roveal defects in American designs that are responsible for so many secidents and deaths of art responsible for so many accidents and deaths of apperatures and professionals on the transing grounds of this country and which have been laid to encoun-sabotage apparant) without cause. These accidents and deaths have run in greater percentage on practice work at home than in actual warfare abroad with foreign maximus harring of course machines and men-dicativosed by hostic fire. The inference form the reports with a function insandartures have not taken the same corrective advantage of remediers as have foreigners who have had constant inspection of machines in America there were merely trials of ma chance abroad machines got their tryouts in actual service resulting in quick remedies of many defects

It may be stated in advance that the investigators have not found remedies for all defects 1 ar from it Avia tion is still in the experimental tion is still in the experimental stage. The defects and remedies pointed out apply only to what applianes are to-day. The perfected urplane is a matter of tomorrow that is the ariplane which like David Haruns borse, will stand without lutchin and a woman can drive it. A perfected airplane will be a machine that will wholly replace the automolile that men wemen and cluideen will be as safe and as lengthed with as the automobile and as capable of driving also one that will really annihilate An attempt will be made

herein to summarize in under standable language the reth reports of the sirplant investigaports of the arpant investiga-tors within the limits of an article omitting very properly the names of the manu facturers, who, under the stimulus of war will un-doubtedly take full advantage of any and all remedies offered conclusively Where possible, exact quotations will be made but much reduced. Much of

the cpr innental work was performed by Masser Hiff and Douglas. The secillating apparatus for longitudinal and Douglas and deepend by Mr. Chow under direction of the control of the contr the experimental work was performed by Messre Huff

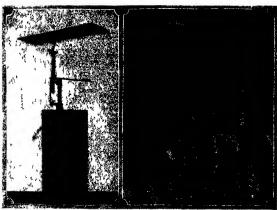
accidental cause, is a slow undulation involving a range and sinking of the arripanes well as a pitching motion. The undulation is stable for high speeds since it is rapidly damped out. At lower speed, the undulation is less heavily damped until at a certain critical low speed the damping vanishes. For speeds below this critical speed the undulations tend to increase in amplitude with each swing and the longitudinal motion is therefore unstable. The military anoshim showed a critical speed below which it was longitudinally unstable of longitudinal shall be a simple matter to secure any desired degree of longitudinal shall, when the first time

pointed out by the use of properly inclined tail surface and light wing loading Excessive statical stability as indicated by strong restoring moments is undesirable and may cause the motion to become violent in gusty and may easise the motion to become violent in guity are Ihu violence of motion may seriously impair the pilot's control and the airplane may take charge at a critical time Longitudinal motion for any particular speed may be made dynamically stable while at the same time only slightly stable in the static seeme, by the use of large fail surface which lies very nearly in the relative wind If the minimum of statical stability be combined with the maximum of datings the pitching will be very slow and heavily damped The longituding the stable and yet be without violence of motion in guids.

be without violence of motion in gusty air. In general primitive among pilots against 'very stable aerplanes is believed to be justified. It cannot be too strongly insisted upon that true dynamical stability is better given by damping than by stiffness Peperanes with rolling vessels has left to the design of types of small metacutire height (a measure of statical stability), fitted with bulge News (damping surface) for

stability), fitted with bulge keels (dampling surface) for passenger carrying. Here an infort is made to get away from the violence of motion associated with stiffness. We determined necessary accordantaled constants by wind tunnel experiments whenever practical and calculated by simple approximate method two confinents which cannot be restally found experimentally. The shareder of the motion is considered to the second of the control of

algebraically It was ascer-tained that lateral motion is and side alip, or skidding One type of motion is a spiral subsidence if stable, or divergence if unstable One type of one type of the control cace if unstable One type of machine becomes spirally un-stable at low speed. The motion is a spiral dive, due to an overbank and a side slip miwards. The airplane makes a rapid turn with rapidly increasing bank accompanied by side slipping inwards. The instability is such that an initial deviation from course will domble transfer about will domble transfer. will double itself in about seven seconds Such spiral motion may be made stable by adequate fin surface above the center of gravity or upturned wings and by reduction m weather helm due to too much rudder or fin surface aft The American mulitary ma-chine showed the same sor on the showed the same sort of spiral instability at high speeds. It had no dihedral angle of wings but had a large rudder and deep body."
Whether so intended or not, the above paragraph



At right, the aerodynamical balance beneath the wind tunnel; at left, the upper and that projects into the tunnel, bearing, in the picture, a model wing where retaining mements are being investigated



Details of the wind tunnel. At left, the entrance nozzie, showing end of honeyromb in center, a more general view of this end of the tunnel at right, interior of the diffusor, looking from the propeller

accidents in pockets or vacuums in the air. A muchine going at high speed, sprailly unatable plunges into the pocket, turns tail up, and dives toward earth. The public, it seems, has only seven seconds to work his controls and right his machine. Foreign machines early in the war game, so corrected their functions as to allow the pilot 55 seconds to recover balance with his controls, that is to any, by correction of functions the initial devisation to the pilot of the property of the proper

greatest menaces to avaston

'A second type of motion as called the Dutch roll'
from analogy to a figure in ice akstung. The aurplace
takes up an oscullation in vaw and roll simultaneously
it swings to the right banking for a right turn, then
swings back to the left banking for a left turn. The
combined yaw and roll has a fairly rapid period
proved the period is at accorded and an initial amplitude
is damped to belif value in less than two seconds. At
low asced the nerrod is 12 seconds dauged to half

is damped to any value in sea strong to verseous of the period is 12 seconds damped to half from an approximate calculation that the Dutch roll may become mentable if an arripane has too much high fin surface and if there is not sufficient weather helm or rear fin surface. Those conditions are the reverse of those of april mistability. The conflicting nature of the requirements augustes that han arripane is unlikely ever to be unstable in each sense it also indicates the difficulty of obtaining lateral stability by raised wing tips. Thus our multery merchine was spirally unstable at high speed and stable with the Dutch roll At low speed it was spirally stable that the more of the spirally stable than the speed in the spirally stable believed that the majority of arribance of ordinary type are spirally untable because of excess of fin surface aft. When attempts have been made to remedy this fault by use of a large dishedral angle upwards for the wings, matters have been made worse of it is only to be expected that the order ordinary type and the spirally stable that the order ordinary type are spirally untable because of excess of fin surface aft. When attempts have been made to remedy this fault by use of a large dishedral angle upwards for the wings, matters have been made to remedy this fault by use of a large dishedral angle upwards for the wings, matters have been made to remedy this fault by use of a large dishedral angle upwards for the wings, matters have been made to remedy this fault by use of a large dishedral angle upwards for the process of the stable process of the s

Dutes rut district on less viocates hay be introduced. Especially in guards to produce violent folling. Our experimental ruschius with a slight rate of wings about 16 degrees and a small rudder has shown that at ordinary speeds it is stable in every sense. longitudinally and laterally, and that it is possible to seemer a degree of stability in every airplane of conventional type. But whether this stability is excessive in turbulent air pie each particular machine can only be determined by actual flight is it.

"If as airplane be unstable in still set it is obviously

"If an airplane be unstable in still set it is obviously worse off in guite. The boursess is unfortunately not true, since it may be very stable in still arr yet be so stiff finish it utpulsent air that it will be violently tossed about. It is conservative to conclude that airplanes should not be unstable and that they seed not be, almostight changes in the nature of adjustments suffice to conseque, such instability of motion. With military planes inside the none of first, the probability of controls where the summer of the probability of control where the summer of the probability of control of the summer of the summer of the probability of the summer of the

use when those controls [1] and it should be judged only as an accessory to usest a pilot rather than as a curs-all for inherent init if it of an arriance a motion. There is no use to sack radical tange, of type to accurstability when an ordinary type of plane kinds itself to adjustment which make for inherent stability of motion. Freak airplaints of great stability may be consurely stable in some ways and frankly unstable in others. It is likely that the coming most satisfactory airplane may be only slightly stable and that it will in any possible attitude he cash, outrolled by the pilot just such a machine was anomined in press dispatches from London researchy at I alled The I only I have the controlled by the pilot of the cash. I have been also that the cash of statical stability in I consultrable damping. I have not statical stability and the unifinum of damping. Then appears to be of advantage the provide the minimum of attaical stability and the unifinum of damping. Then the simplace is motion will 1 of viry long period but heavily damped. Full understanding may be liad of the effect on the motion of each change I ya systematic.



An improvised machine for shaping skip-plates

variation of one feature of design at a time. I be process to flocosaty lakenous but compared at the difficulty of full-scale experiment in one is all the oddinction to rapid and new; times. I he racely nose for incitual fying to obtain any tota of the effect of slight changes in design. Weather conditions moster trubles, personal perularities of pilots of the tent of add to complexity of an otherwise very simple problem. "Experimental flying is dangerous. A pilot to de-

"Experienced flying schaperous A plot to determine whether a new arplane set spready unstable to get into a spiral dive. I be mechanismated five or ax turns of rapidly widening and contracting helix before he could bring it out or a horizontal path. If the controls had, been only a littje less powerful, the mechane would array have exceeded to the ground. That the controls were adequated was purely a matter of good fortune was demanded twee purely a matter of good fortune to the control of the control of the controls was accessed in that spiral fastability was demonstrated. Only a few minutes of time was required, two study of the control of the control of the (Openhaused on poor 121)

A Home-Made Machine for Cold Plate Bending

A YAR or so ago a shill huiding concern in Penascale. He shorth was realing it completion a new plant, went into the open markst in scrib of a set of cold bridge gold is that would foll plates up to 30 feet in length. They found that the best they could do would be to pas about \$850 000 for a set which could be delivered to them in 15 months or thereabouts so it became necessary for them to devise some sort of a substitute for the conventional rolls. The result is the plate-bending medium dilustrated herewith

This machine consists of a structural frame with backing up brackets and squired had former setting on a concrete formulation. In plate to the best are placed on edge in the machine between the brackets and the formers as shown in the photograph. A sense of chains attached to the structural frames passes over the end of the plate thence over these was anchored to the end of the plate theme over the end of the plate theme of the plate to be best to a uniform radius a master valve is opened whith controls all the cylinders and applies a uniform pull on the plate of the plate in the proton of the plate more than others the master valve is openium or than others the master valve is openium on the plate more than others the master valve is openium or than others the master valve remains out of action, and

cyluders and applies a uniform pull on all the chains If it is district to bend any portion of the plate more than others the master valve remission out of action, and the appropriate individual valves go into operation By raising or lowering or advancing or retarding the backing up brackets or the forters a the plates can be

bont to any desired radius

The machine thus developed met the
emergency against which it was designed,
for it cost about \$15 000 and was ready
for operation in less than three months

"Liberty Fuel"

A GIOD deal has appeared within the past few seeks upon the motor fuel invended by two army officers and the general tone of this entotics coughted with the suggestion of governmental acceptance carried by the nane under which the new compound was amounted line ted to a rather enthinsiation find it is soon to right a good to replace good the sale. If was not for a long time possible to get data on which to bean intelligent comment but price department of January 14th at last, inter this need.

If that last met thus need the appears that some 65 per coat of the new fuel is bens) while of the kerowen previously announced as the base, there appears that 25 or 36 per tent. To anyone acquianted with the supply and demand for bensed the parts the Latert Fuel on the defensive at once If all the housed which we are now producing could go into far mudafeatines it could not be made in sufficient quantity to replay more than two per cent of the gasolius which we now which we now which we now which we have

of the gasonin which we have us. The descript Fuel Of course this does not mean that 'Laberty Fuel Of course this does not mean that 'Laberty Fuel But it does mean that for the present it as not to be thought of Only by a complete revolution in the ways of gatting bearol and probably in the sources of supply as well could a fruit ornizining 55 per cuit of this substance become a commercial proposition. When to this is added the further returnments that the invitories would not apply the Bureau of Standards with their formula too finally gain some of at for test if Louds everval grave technical defects at seems quite clear that the whole thing is more of less of a bubble.





SHANGHAI



THE plows of Egypt are still being pulled by oxen Ablebodied Hindus are carrying building materials on their backs. Progressive Japan still has jinrickshaws.

But labor grows scarce Man-work must be diverted to fields where it can best serve. Muscle is fast losing the right to compete blindly with mechanical power.

Egypt is already taking up farm tractors. Motor-trucks must go to India. Japan will replace jinrickshaws with taxicabs.

Wasteful methods are falling by the wayside. The age of machinery will not be denied. The work must go on.







CALCUTTA







HELIOPOLIS

SINGAPORE

THE age of machinery spreads outward from America During the ten years ending 1916, nearly \$1,150-000,000 worth of American machinery was shipped to all parts of the world.

In America alone, 125 leading manufacturers of power machinery specifically recommend or endorse the use of the Vacuum Oil Company's Gargoyle Lubricants to the purchasers of their equipment.

Vacuum Oil Company Branches and representatives dot the earth. Men serving under the red Gargoyle have taught unaktiled Malays how to operate their American engines. Oriental and African misuse of lubricants has been corrected. The more intelligent peoples who lacked mechanical carefulness have become informed.

New inventions often bring new lubricating saceds. As these needs arise they will be met by new Gargoyle Lubricants. To safeguard the correct operation of machine ery going to all parts of the globe, the Vacuum Oil Company maintains an ever-expanding world organization.

The work must go on.



Lubricants

A grade for each type of service

VAÇUUM OIL COMPANY, New York, U S. A.

Specializes in the standfactory of high-grade lubricants for

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PORTUGAL



MANILA



BANGKOK



WELLINGTON New Zealand









Mechanical Equipment of the Farm

Latest developments in agricultural machinery and practical suggestions for the farmer

C and and by HARRY C RAMSOWER Professor of Assicultural Engineering Okio State University





A farm tractor with broad, cleated wheels for field work and rubber-tired wheels for service on reads

A Rubber-Tired Tractor

THERI seems to be no lack of new ideas in the dovel numerit of farin tructure. Road work with a trantor while much faster than toam work has seemed trator while much lister than toam work has seemed to many to be rather slow. Speeds of from \$25 to 4½ miles per hour are about all average tractors make With the regulation wheels equipped with lugs it is perhaps not wise to run a tractor on the road faster. than this because all parts would be subjected to too much iar and strain

A prominent eastern company has solved this probelm by providing one set of regulation wheels for heavy traction work and another set of rubber tired wheels for road work and another set of runer tired wheels to the other is easily and qui kly made. With the rubber tired wheels a speed of ten miles an hour is possible and the wear and tear on the machine is reduced to a minimum Of course there are some drawbacks to such a combination as for example the additional cost anten a communitation has for example, the ad fill half cost of the extra wheels. To I alance this however is the fact that with much hauling to be done a remarkable saving in time would be effected in the course of a few

Aside from the road wheel feature this machine is a r il tractor It is built on neat attractive lines and material of good quality seems to have gone into its making. It is equipped with a four cylinder motor 4 inches by 6 weighs 3 850 pounds and is given a rating of 12-24 horse-power It seems to handle a three-bottom plow in a very satisfa tory way

One feature of especial note is the convenient and comfortable sust for the driver. The awkwarl un comfortable position which the driver must assume on many tracters constitutes an everlasting objection On some ma hines the driver must sit strad lie to the motor or frame, and cannot evall, change his position. To stin such a manure for several hours at a strict in stresom to say the least. The driver too is quite well protected by the very ample guards from the dust ard dut thrown up in the field by the traction wheels a feature well worth c nadering in the jurchase of a tractor

Keeping Farm Roads Fit

THF roads and lance on the average farm fall into a liner or less disreputable condition during the winter and spring months making passage ever them for teams or stock difficult and disagreeable. In a large part neglect is responsible for the condition It is quite



Using a grader for open ditch work

possible to make a good road out of earth and keep it good. A good road, his a good house must have a good roof and a dy cellar. Adequate underdrainage by way of a line of tile on one or both aides of the road will provide the dry cellar. and a smooth surface with good

The grader or terracung machine shows on this page, is inexpensive and yet effective in grading up the road When drawn by four or an knows as mile of road can be graded quickly and well. Once graded it will be necessary only to go over the road sitter heavy rains to fill up stock and wagon tracks and rub off high spots so that water may not stand on the surface. A splicing drag or one made of planks will accomplish the same purpose after the properties there are the properties of the propertie

drain tile

The road grader drawn by a tractor shown on this page, rupresents an interesting combination A 30-foot roadway is completely covered in a single operation Several miles of road can be touched up in one day with such a rig. The tractor is doing the work of 24 horses and six men.

Lack of Equipment in the Farm Kitchen

Lack of Equipment in the Farm Kitchen
THE statement that the American people have been
much more tordy in the purchase of modern laboraeving oquipment for the farm home than they have for
the farm proper and for the barn reaanch be successfully
contradicted. The sixtle has been replaced successively
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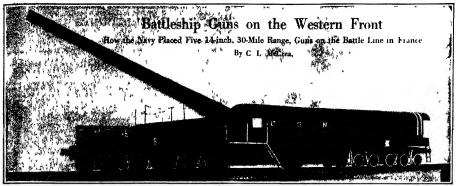
One reason for the lack of equipment in the (Continued on page 128)



The machine above used as a road grader



A 25-50 tractor grading a 36-foot rend in a single operation.



The 14-inch naval gun, on its specially designed car, used for shelling the German terrain for 30 miles back of their front

DURING the closing days of the year 1917, ordinance experts of the U S Navy, who had been closely watching the trend of events in the great war, became incessly inserted in the effect of long range bombard metals and the second of the control of more often not)

While the Navy's limited testing facilities proving ground with a range of only 18 000 yards—had never permitted the firing of its big guns at high angles of elevation, it was felt that the 14-inch 50-caliber naval rific was superior to any German gun built, in range, accuracy and striking power

The 14-inch naval gun throws a 1 400-pound projectile

at a mussle velocity of 2,800 feet per second. With the Navy type of shell its maximum range is well over 40000 yards or 22 miles, while using a special shell designed for firing at extreme ranges a range of about 55 000 yards or 29 ½ miles was possible Areas for destruction not hithorto touched were

opened to a gun of this range Troop centers lines of communication, railroads, reserve store houses and sumilar strategie points almost too numerous to mention could be destroyed by such guns If mounted so that eould move rapidly from target to target, their possibilities were almost unlimited were urgently needed Rear Admiral Raiph Earle, Chief of the Navy Bureau of Ordnance recognized that need and saw that if a battery of 14-inch guns could be placed in action on the fighting front in I rance by the

summer of 1918, they could render a real service to the

It was decided that the emergicy was such as to It was deeded that the energ rev was such as to warrant using guins for this purpose this were intended for replacing damaged guins if the Fleck Risks had it be shouldered in making that desire but in time of war and noed, responsibilities are heavy in all matters it was therefore, proposed to I suld mobile mounts if r the guins (which meant rashwir meints for in no ethics way could the 38-56 in Hearth guin let transported) completely equip them and place it lem in action in France before the close of the summ righting in 1918

In less than 30 days, complete designs were prepared which called for a battery of five guns each gun car train to be provided with a lo mustive for hinding it two ammunition cars three berthing cus to house operating personnel a crane car flat cars and gond la cars for carrying material as well is oth r civiliary cars. In addition to the hve gun car trans a sixth train was provided to go independently fr in one gun position to another. The equipment totalled five gun cars six locomotives and 72 cars

The gun car consists of two large bridge girders tied into a single unit. T2 feet long only wighing 68 tone in the wall between the two quietes sim int of the 4 in which and a gun which with yoke and 1 r h mechanism weighs 95 tone and the 64-ton p in shide in which the gun moves back during recoil. In his fraulte recoil between the counter recoil mechanism are attached to the gun slide. The ontire unit consisting of grediers and the counter recoil mechanism are attached to the gun slide. The outre unit consisting of grediers and the counter recoil and the counter recoil of all the counter of t into a single unit 72 feet long and wighing 68 tons it and the foundation adjusted unt I tle entire weight of

the gun car is carried by it
Aiming is accomplished when firing from the rails by

the use of a curved track A simple traversing gear is provided to enable the gun to be samed when it is on the pit foundation

the pit foundation
Pvry item went forward exactly as planned. Construction was pushed to the limit and all speed records were broken. In he inst mount was completed on April 28th 1918—just 7.2 days from the date the contract was signed 120 days from the date the designs were first started. Thus mount was proved at Sandy Hook N J on April 30th 1918, where it met every test most successfully. June 1st 1918 saw the complete fulfilment of the first phase of the project—the Naval Railway Batteries were ready for shipment

A slight delay occurred in the shipment of the batteries to France for the German submarine U 151 which was orerating off our ceast seemed to be especially anxious to prevent the shipment of the material submarine danger however was soon overcome, and by July 4th 1918 practically all the material was en route to it Nazaire I ran e where an creeting gang of American Blue sackets was eagerly waiting to put the guns together and get them into action. The French too, together and get them into action were just as eager to get the guns into action so work on the assembly of gun ears No 1 and No 2 and their trains was rushed and they left for the front on August 17th and 18th respectively

After a short trail trip over the railroads of France, and some preliminary tests those guns were rushed to Laon where under the direction of the 10th French Army they had their hirst shots against the Germans on September 6th 1918—nine months and ten days from the date on which work was started

the date on which work was suaried.

At I son the guns inflicted great damage their crowning achievement being the destruction of a crowded German moving ricture theater. One 1 400-pound Scrman moving picture theater One 1 400-pound shell hit the theater leaving nothing but a deep crater in the ground marked by scattered debris and identifica-

tion tags of former occupants of the building

Gun trains No 3 No 4 and No 5 and the staff train,

(Continued on page 129)







Lewering the gun onto gun girder for transporting to erecting shop

World Markets for American Manufactures

Educal by LYNN W MEEKINS

A department devoted to the extension of American trade in foreign lands

Far Eastern Demand for Motor Cars

THE man who drives in automobile through such striction from the such that the interaction is of boar striction. New York and I flings has faith to worry him compared with the spenter of a motor vehicle in the compared with the perater of a motor value in of the Orent such a automobile exporting recently. In China and in Lapan the good reads are practically limited to the large cities where there is no he amost of allow moving vehicles and pedestinus that it is hard work. sometimes to jass a small. Although the rural visitor to New York may jump helf way out of his shoes when the piercing sound of a motor horn strikes his car the resident of loke pays no attention to such sounds - he

has the right of way preferred chafty because the Japanese lady doesn't wear a hat. Her hair has been painstakingly combed and she shuns a breeze Other features favoring the closed on a lokio are the clouds of dust in or Not that open cars have no lies meet the demand for country travel and are popular with the foreign residents

With more than \$1 250 000 000 capital invested the American automobile in-dustry is second only to steel in the manufacturing field 1 xport business is vitally necessary for its continued prosperity, and there is a steedy mereuse in the number of motor companies entering foreign fields One of the best known manufacturers in

this line is conducting a seminific siles
campaign this is planting his products in
the world's in set productable markets. He
is sending high-salibered representatives to make
systematic studies of the nocks of his prospective customers. Hose men as supplied before they leave the
United States with all the information that is obtainable
The state of the state of the state of the state of second They start out with a fur knowledge of general conditions in the countries to be visited, with particular emphasis upon road systems, fuel costs and the purchasing power of the people lile motor vehicle has to have something more than a footpath to travel over, gasoline or an equally efficient fuel, to keep it going, and a regular expenditure to maintain it

Where Faverable Conditions Prevail

Good roads and prosperity usually go together in the Orient as well as in other parts of the world They are found espossally in the Philip pines the Straits 'etitlements, the I ed-crated Malay 'tates and the Dutch Least erated Malay States and the Dutch East Indies Last year the Philipumes enjoyed the largest trade in their history. The natures are the principal buctrs of motor cars and they prefer small, lower-preed machines. In Manils most of the estab-ishments that used to keep horses and valueles for hirr, now maintain motor cars for real by the hour. A motor bus line for reat by the hour A motor bus line is projected and if fuel costs do not decrease the company operating these busses will import gasoline from the United States in its own sailing vessels

There are more than 3 000 miles of improved roads in the Strats Settlements and in the Federated Malay States. This region is well off financially because its raw materials-mainly rubber and tin were needed for war purposes, and they are also important in time of peace Purchasers of automobiles (and this state-

rurements of automornes (and cus state-ment applies equally to buyers in the Dutch Fast Indies) are interested in cars of the better grades - Freight rates to these countries are high and the man who buys an automobile thinks are high and the man who buys an automobile thinks he might as will have a good one, because a considerable part of his investment is spent on transporting the machine from the United States

Manils is a good distributing point not only for the Philippines but for much of the Orient The manufacturer introducing his car into Malaysia should conentrate his efforts in Singapore Batavia and Sora-baya are the principal ports of entry in the Dutch East Indies The motor car business in other Far Eastern countries is centered in Shanghai for China, Tokio for

"A MERICAN manufactures of office equipment A have firmly established themselves in the Argenteen market, writes an American representative from Buenos Arres "They have the reputation of designing the most practical and the most efficient and such as a sive that is so well liked, in the var preceding the war, Argentine spart at Beat 3750 000 for American Office furniture and for chash to be used in thesters and

400 480 S.AC ...

Transporting timber in the ancient fashion

schools Just before the war broke out, there was a financial crisis that hindared sales, but the country has become prosperous since then, and furniture dealers have

become prosperous since then, and furniture dealers have deposed of most of these stocks. Now there as shortage, "American deales are so popular in Argentina that few business men will have any others. Low roll-top deals not preferred to those of extremely high style, it is most profitable to import dealers of medium to good grade, be ause the duly and the freuth rates use no higher that in they are on othersper kinds, for which there is not on the state of the state o

American Chers in Demand
According to a chair manufacturer who has received
many orders from Buenos Aires and other Argentine



The Sultan of Sult and his staff in an American car

cities, the largest call firstor cheap chairs known as the Grossat type, which are discovated with seconded designs. The Argentine mariest shorted nearly 30,000 of these chairs monthly billies (keepin. The Statches preferred chairs monthly billies (keepin. The Statches preferred them a good wate of granight and pack them "Euroched down," one domain is given. They are subject to a drity of say passe (SLM) jeer dozen. It is a split key a time familiar with the Argentine frantisys instructive that hundred suites equations of four chairs, two argentials and one drit, for see in splitted and one drit, for see in splitted and one drit, for see in splitted and the subject is a subject to the second seed of the s

Japan, Calcutta, Bombay and Madras for India; and Baagkok for Stam.

Argenthas Likes Our Office Furniture

"AMERICAN manufacturers of office equipment on or more American switch about 20 perce Science and Company of the Science of the Science of Science and Science of Science and Science of Science and Science of Scie as probably three hundred dozen per spoath can he sold.

be seld. The education of Argentina office assistants in this intelligent toes of modern time- and inbor-saving derivings will largely increase the sales of American correspondence files and card index systems, which already have been reconstully introduced. If manufacturers of American office furniture swoidle equip free otherspectures of American office furniture should equip free otherspectures of American office furnitures and the control of the second of

Sectional bookcases are good sellers in Sectional bookcases are good sellers in Argentina I is important that the bettom section should be provided with wooden doors to conceal the paper covered books, which become ragged and solled from constant use. The size desired for this section is a depth of from 16 to 18 inches and a similar height.

Because at present price counts more heavily than quarty in Argentine, the sale of steel office furnature will be some-what restricted. Although prices are very high, there seems to be a continual demand for steel files and eard index cases. A or steel nies and eard index cases well-directed campaign should place in railway offices, hanks, commercial houses, ad Government buildings the modern equip-

hibraries, and Governmen ment that they now lack

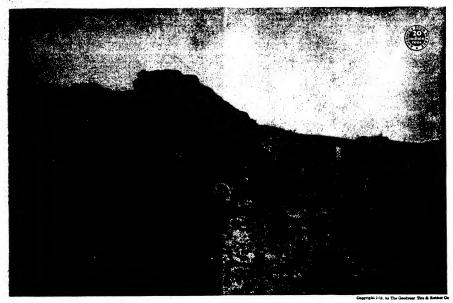
How to Ingress Our Sales

"The American furniture manufacturer must keep three things in mind if he wishes to build up a prediable business in Argontian," and a vasitor from Reserio "He should standardise equipment, making fewer changes in dimensions and styles Borne time ago, I bought some correspondence files with the understanding that more of the same kind were obtainable standing that more of the same kind were obtainable when desired Naturally it was considerably annoying to be told later that a newer style had replaced the variety that I had bought The lack of uniformity in color limits the sale of American furniture

color limits the sale of American furriture. The golden quartered-oak finsh is the most popular in Argentina, and all kinds of office equipment should be in the same shade of that color. It is sometimes difficult to match deals and chairs with bookeases and other equipment. Your nanufactures should settle upon definite styles of golden eak, light or dark.

"These are to peaking, Bhapments from "The are to peaking, Bhapments from the peaking the p

bill of several hundred dollars more than was necessary Sanitary bases for sectional bookcases were shipped set up in a box, and under separate cover were sent a number of empty card-index boxes which could very easily have been pooked in the unused space within the bases. As freight necessary the sent of
the American packer that export free, specially to Latin America, quite fine, specially to Latin America, quite In moving stud by vall coprise into the next sees, itself may be based on weight alone; but a shaje with the care of the control of th



BOSTON to BOSTON Via San Francisco and Los Angeles

TWO Goodyear motor trucks, shod with Goodyear Pneumatic Cord Truck Tires, recently carried full loads from Boston to San Francisco and returned to Boston by way of Los Angeles.

They were taken off their regular Akron-to-Boston route without special preparation and sent west.

As shown by the recordograph, they completed the 7,763-mile round trip

in 24 days, 1 hour and 55 minutes of actual running.

The journey constituted a remarkable demonstration of the ability of motor trucks, equipped with Goodyear Pneumatic Cord Truck Tires, to account the worst kinds of going found anywhere.

For 71.5 per cent of this transcontinental jaunt was made over unimproved roads and in wagon trails.

The traction of the big Goodyear Pneumatics enabled the heavy trucks to negotiate mud, sand and grades that would have stalled solid tires.

This memorable performance of these pioneering Goodyear Pneumatic Cord Truck Tires points to their immense advantages for both highway hauling and off-the-road work.

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO



Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts



Making the most of the bicycle during winter months

When the Bicycle Becomes an Ice-Boat

WHY leave the bicycle idle in the VV cellar during the winter months?
When the roads are covered with snow the bicycle can be turned into a temporary ice boat and used on frozen bonds and rivers At least that is what occurred to a Brooklynite and he set to work to prove

The bicycle can be readily converted into a serviceable ice-boat hy removing the front wheel and using in its place some form of frame resting on a pair of skates In this case the Brooklynite arranged the frame with two small seats so that he cou'd ride about with two youngsters for company s sake Using a non-skid tire on the roar wheel it is possible to attain considerable speed with a vehicle of this kind and in the absence of a non-skid tire, a bit of adhesive tape at regular intervals along the tire serves the purpose

A Saw That Is Different

THF saw herewith illustrated, and recently placed on the market by a Newark manufacturer consists of two steel arms actuated by a powerful connecting spring and crossing at the other end through a slide Brackets are fastened to each of the flat ends to which the blades (or plain pressure bars) are attached These brackets are so made that the blades can be fitted with terth in or with teeth out and at any place on the flat end of the frame Accordingly the outfit is extraordinarily flexible and can be adjusted with great exactness to the particular size and position of the tree or lumber to be cut Iwo blades can be used cutting against one another like used cutting against one another like the blades of a pair of scissors er a single blade opposed by a plain pressure bar, as illustrated

When starting the blades, or blade and bar, are spread against the resistance of the spring, so as to straddlo the tree er the spring, so as to assume the spring, so as to assume the property of the product of the second product and for the concessive product of the second product of the product of the second product pr

The great advantage claimed for this outfit is not alone in the great decrease of elbow grease which it requires—a decrosses so great that a child can out the heaviest trees or timbers according to is t be considered the great convenience of being able to apply the saw wherev destred One can steep over and cut a tree flush with the ground one can insert the blade under a prostrate log and cut the latter regardless of its position one can stand on a limb and sever another limb above or below in fact the saw can be used in all sorts of places where it would not be possible to employ the ordinary cross cut blade Government tests indicate that one man with this saw ean work to hetter effect than two men with the ordinary cross-cut saw

A Decorticating Machine for Flaz

EXPERTS in the preparation of flax have recently had their attention drawn to an invention of Mr A L Spalding of Dundee Scotland, which, according to the claims made for it, can according to the claims made for it, can perform in a five hours all the processes of preparation from the time the flax is pulled from the ground until it is in a state for naufacture The si, infeance of these cause is made sufficiently clear by the s atoment that under present technique this preparation consume weeks of time and a great volume of labor

For centuries scientists and mechanics have been experimenting in the effort to simplify and improve the process of retting but progress has been so slow that if Pliny were to return he would recognize present methods as substantially identical with those described by him as employed by the L_b p(tans the flax magnates of his day Alter the rippling comes the steeping the plant being placed in a large receptable filled with water and covered receptace filled with water and covered with straw and stones A fermentation is here set up, requiring the nicest care to avoid over-or under retting Then the flax is taken cut and dried, broken, soutched and hackled

All this requires from two to four weeks.

But by the Spalding pro-cess the reeds are taken from the field and put directly through the de directly through the decor-ticating machine which takes off the seed and prepares the shove The material is then scutched, the gum extracted and it is ready for manufacture It is said that the whole proess consumes fewer hours than the present one does weeks in add tion, Mr Spaling claims that his process would save an enormeus quantity of straw which is now burned or put back in the ground, as well as of gum and shoves which at present are obtained only in a very unworkable state or put back in the ground

Dun lee experts who have examined the apparatus and tested the ma terial which it turns out are very favorably impressed by the results and

pressed by the results and some maintain that if properly developed, the machine should revolutionise the whole flax industry Others, while freely conceding the value of the processes which have been discovered here, are in doubt as to their success on a practical com-mercial scale in any event, the future development of the invention will be watched with the greatest of interest



AT the mention of periscopes one AT the mention of periodoges one another war article Periscopes are generally associated with military or naval warfare But in this case the periscope is far removed from warfare, this is a story of a little ingenuity applied to usic and the theater Herbert L Hyde, composer and mem-

ber of the Chicago Symphony Orchestra, came to New York city some time ago to rect his own music at the premiers of



Orchestra leader following the movements of the players by means of a periscope

two well-known plays. To his diamay, however, it was discovered that the orchestra pit in the theater was under the stage yet the domands of one of the plays—a pantomine—required that Mr Hyde watch the stage and direct his orchestra so that the music would syn-chronise exactly with the movements of the actors
The difficulty was finally solved by the

use of a tranch periscope, permitting Mr Hyde to follow the movements of the players from his director's seat under the players from his director's seat under the stage. The periscope shown is an exact copy of the historic one which Capt Bairnsfather supplied for his soldier musical comedy, 'The Better 'Ole."

Recent Patent Decisions

Operativeness —A prior patent for a machine although the machine may not be practically operative, may operate as a prior publication, which will invalidate a subsequent patent to another, which embodies the same principle in an oper-ative machine There is a presumption from the grant of separate letters patent for two improvements on the prior art, but there is a specific difference between but there is a sponific difference between the inventions. As against complainant in an infringement suit, the presumption of utility of the machine of a prior patient is greatly strengthened by the fact that complainant for many years represented it to be useful, and the machine of a matter than the property of the property of the pro-sumer strength of the property of the pro-sumer strength of the pro-

but invention may reads in a new combination of old elements, such as to give a new and an ornamental effect —Knapp v Will & Baumer Co USDC of NY

w Will & Baumer Co USD C et N Y Improvement on Another's Patent.

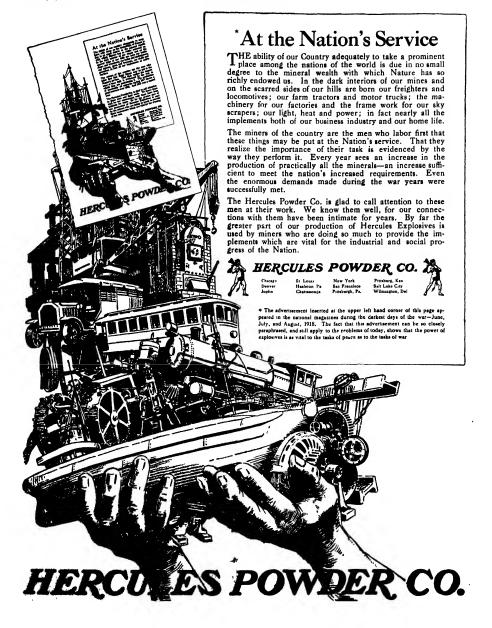
—If a defendant appropriates a patented invention and improves upon it and obtains a patent, his patent gives him an exclusive right to the improvement, but no right to use the favention of the prior

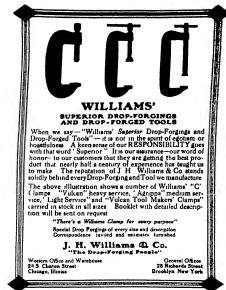
no right to use the invention of the patent — Rnapp v. Will & Bounes U. S. D. C. of N. Y.

Scope of infringement Decrease to the party to an infringement (Commond as party 189)



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where the formula was first tried out are still in service and treated regularly The original tubes are apparently as good as new, and no builer repairs have ever been made or found necessary. At all times the boilers are practically free from scale. The remarkable feature of the boiler

preserver in question is that the chemical formula has proved satisfactory in every kind of boils' feed water thus far tried, and particularly so with well water used for boilers. The chemicals used do not injurested exat rom brass, copper, rubber, glass valve and packing. The composition prevents parting, removes boiler scale gradually and prevents the formation of new scale. It will not carry over with the atom and does not interfere in any way with the librication of steam eyilinder with the profession of the composition of t kind of boiler feed water thus far tried

The boiler preserver referred to has stood for six months in wooden barrels stood for six months in wooden barrels without nigray to the latter, indicating its harmless nature A gallon of this preserver weight about 9% pounds, and the quantity generally preserbed for boiler use is two gallons per week for every 126 horse-power of boiler capacity It is generally fed into the boilers through the boiler fed months. boiler feed pipe

The Current Supplement

I NDIA is a land of mystery to most of us, and the customs and manners of the Hindu are difficult of understanding by Hindu are difficult of understanding by most Occidentals An article in the current issue of the Scientific American Survialment, No 2246, for February 8th, on Some Aspects of Hesdu Life in India deals particularly with the family life, and draws a picture that is intensely interesting and which will be read with pleasure as it is written by a native who thoroughly understands the intraceits of his subject. The Hero Shrew describes and illustrates one of the most currous animals. has subject. The Hero Shrea describes and illustrates one of the most currous animals known. The series of papers so Anomalizes of the installation of the installation of the installation, the present installation treating of the installation of of an important problem in the construction of optical instruments, and is accompanied of optical instruments, and is secompanied by many explanatory disgrams Photo-graphs on Salied Paper gives instructions for the preparation of a material which enables the production of an extremely wide variety of effects and gives most beautiful results. Other articles in this issue are A South Carokine Meleor, Dis-coloration of White Point and Action of a-Ray on Meleor.

The Instability of American Airplanes (Continued from page 118)

Consisted from page 111)

Were necessary. To complete the experiment, it would be necessary to repeat the dangerous feat for every change which are consistent as the experiment of the confidence of the confiden

A Boller Proceever Which Ethniantes Boller Troubles

Boller Troubles

In this advanced day there seems to be in little excess for boller troubles. At the six one boller preceiver is now in use which is claimed to eliminate all boiler troubles. In fact, the formula for the manner of the process of the plant wind if we turn to practical stripped you when the formula was first traed out are where the formula was first traed out are the past 30 years and the boilers of the plant wind if we turn to practical stripped your process of the plant wind it we turn to practical stripped your process of the plant wind it we turn to practical stripped your process of the plant wind it we turn to practical stripped your process of the plant wind it we turn to practical stripped your process of the plant wind it we turn to practical stripped your process of the plant wind it we turn to practical stripped your process of the plant wind it we turn to practical stripped your process of the plant wind it we turn to practical stripped your process. wind If we turn to practical aviation in the war area, we observe that the air planes which are noted for their seadings.

in the war area, we observe that the shrplanes which are noted for their sessifiess,
at low speeds are the light Antoisets,
at low speeds are the light Antoisets,
at low speeds are the light Antoisets,
at man, various Tanbes derived frees
Editob, etc. These planes have the
war area and the session of the session of the
war area and the session of the light loading cambles the planes to gain a
safe low speed without having the angle of
incidence near the angle of maximum lift.
"An anylane in flight has are degrees of
freedom, three of translation and three of
freation. Any study of its behavior must
be based on the determination of three
forces—excelled an entire the session of the
forces—excelled and the session of the
axes in space. The use of a wind tunnel
in apperments was based on the assumption
that it is immaterial whether the model
moved through still are or was held stationary in a current of air of the same
valocity. The principle of relative velocity velocity The principle of relative velocity is fundamental, and the experimental dis-crepancies between the results of tests conducted by the two methods may be conducted by the two methods may be ascribed on the one hand to the effect of the moving carriage on the flow of air about the model and to the effect of gusty air, and on the other hand, to unsteadiness air, and on the other hand, to unsteadiness of flow in some wind tunnel. The wind tunnel method of superiment requises primarily a current of air which is steady in velocity both in time and across a section of the tunnel I permits a laisurely study of the forces and soughes produced by the wind on the saodel Steadiness of flow of air and an accompanional balance is well adapted to measure with precision the forces and couples on a model in any position. The results are applicable to full scale aircraft 'I he Institute wind tunnel is housed in a shed 20 x 25 x 68 feet in use. The tunnel is 15 feet square in section and 33 feet in

I he Institute wind tunnel is housed in a shed 20 x 25 x 66 feet in use The tunnel is 16 feet square in section and 33 feet is longth. Are farew through an entrance nosite and through the square tunnel by a four-bladed propeller, drives by a 10 feet square tunnel by a four-bladed propeller, drives by a 10 feet section of the square tunnel by a four-bladed propeller, drives by a four-bladed propeller, drives by a feet section of the secti

the speci of the wind in see summer wary some two per cente in twe or three minutes. The cause is not understood.

The gustiness of outdoor wind seems to no effect." Lack of Equipment in it Farm Kitchen

farm home is that we have been as customed to look upon the water system the lighting system the vacuum cleaser the aream separator, etc., as luxuries necessities of the next. The w





lera Gasoline Automob



improved washer the electric iron the sweeper the cream separator the power churn all are time savers and when in telligently installed and used enable it c wife and mother to devote her time and

wife and mother to devote her time and energy to other things. Then too how much those things add to the dignity of the home, to the self respect of the family And such things are the factors of the family and such things are the factors of the money making a self respect of the family and
Battleship Guns on the Western Front

(Continued from page 122)

left St Nasairo on September 12th 13th and 14th After a short stay at the A E F reserve artillery base at Haussimont these guns proceeded to Thierville near Verdun guas proceeded to Thierville near Verdun and opened fire on Longuyon and Mont medy to interrupt the German man rai line of communications between Mets and Sedan. This railroad had long been immune from the fire of the Allied armics at that been up to that time well beyond the range of their guas. It lay at a distance of about 40 000 yards 22 miles bohind the enemy here, and was the only line available for troop transportation other than a line running far to the tion other than a line running far to the tion other than a line running far to the north through Luxemburg. This I ne was an easy target for the 14-inch naval rifles and so at Verdun as at Laon the accurate and destructive fire of those grass created havoe in the German lines Troop movement along the Mets-Sedan line was movement along the Mets-Bedan line was serously impeded a sur gle in from one of these guns completely destroying three railroad tracks for a distance of over 150 feet leaving nothing but a deep shell h lo to mark the spot Within a month after these great guns began their bombar! ment at this point the American Army pushed forward and definitely out the enemy s line of communication

The last shot from the batteries was fired by Gun No 4 at Thierville near Verdun at 1059 A M on the morri g of November 11th 1918 By a curous coincidence the headquarters train carry ing General Foch and the Allied Staff

ing General Foch and the Allied Staff which met the German envoys awa ted the Germans on the identical ading near Compiegae from which the Naval Railway Betternes had fired their first host just Whatever the other accomplishments of our Navy and our Army in the great struggle just passed history cannot fai to accord a place of promisence to the Naval Railway Butteries Reaa-Admiral C P Plunkett U B Navy who com of the according to the Compiegae of its achievements. The Naval Railway or its somevements. The Naval Mailway Batteries were the only strictly American guns in the war and were also the most accurate and the longest ranged, of all the mobile guns of the armies engaged n

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Wood Ash as a Polish

Comeonic has pointed out that the
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luster of the brass candinates, fasch the
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APRUPETOR

Recent Patent Decisions

(Continued from page 128)

and not technically a privy thereto, al-though allied in interest with defendant, is not bound by a decree affirming the validity of the patent alleged to have been infringed Defendant, who admitted in-fringement of a patent, otherwise invalid, rringement of a patent, otherwise invalid, and defended on the ground of public prior use, has the burden of establishing such use beyond a reasonable doubt—
Taigman v Desure et al. U.S. C. C. A. of N. Y.

First Inventor.—The original and first inventor is he who had not only first originated the novel concept, but who through the exercise of reasonable diligence has reduced it to practice—for a mere concept, not reduced to practice, is not paten-table. A device need not be perfect in order to escape the charge of imperativeorder to escape the charge of indparative-ness, and in case of a pioneer patent no one can expect the operative character of the device to respond to the highest test of per-fection—Hildreth v Masteras 253 Fed 68

Combination of Clements - The more fact that human agency intervences in an operation does not render a combi-nation unpatentable nor is it recessary that the action of the elements be simulaneous nor that one of the elements shall so enter into the combination as to change the action of the others—but it is sufficient if there he some joint operation of the elements producing a result due to their cooperative action. To constitute a patentiable combination, the result itself need not be new, but it is sufficient if an old result be produced in a more facile, economical, or efficient way -Willard v Union Tool Co 253 Fed 48

Novelty vs Mere Erlargement — While one who, by erlarging size of paterited article makes it suitable for new use, is not entatled to patent, yet, where inventor combines new element with old obtained, there is invention, which is patentable—Liquid Carbonsa Co v Gil christ Co 263 Fed 54

Patert and Infringement of Minor Improvements - Claus 11 patents for minor improvements in an art clready well understood should be strictly construed The omission of ore element of a claim to a patent averts infringement—lealerbury Farrel Fey & Meh Co i L J Manville Meh Co U S D C of Conn

Narrow Claims -Patert for a mold for making rubber heels, claim of which spe-cified a mold chamber having one wall convex and the other concave, held invalid, convex and the other concave, held invalid, and further held not infringed, if deemed limited to the particular structure shown and described in the patent—I T S Rubber Co v Panther Rubber Mfg Co U S D (of Mass

A "Pioneer Patent" is one which meets an old or plainly recognized want by an entirely new method of approach A machine patent, to be broad enough to macaine patent, to be orose enough to eover every method of approaching a desired result must be base or pioneer, in such a way as to monopolize, not only the particular method but any method making use of equivalents. A patentee cannot claim as invention a combination that has nothing to do with the purposes of the device, unless he uses clear language mak-ing the extraneous combination applicable -F N Burt (o v W S Ritchey & Co U S D C of N Y

Identity of Design — Sameness of appearance to the eye of an ordinary observer, not mere difference of inne or slight to server, not mere difference of inne or slight to server, not mere difference of inne or slight to server, not mere difference of inne or slight to server, not mere difference of inne or slight to server, not mere difference of inne or slight to server the server to serve the server to essenable doubt — Inflexible Co. v Megi-

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one of their reasonants to other from.

Directionalists. Theiri Markanismiry and Directionalists. By Michael M. Davis, Double of their directions. By Michael M. Davis, New York. The Mannilland Company, 1918 8vo, 1438 pp; illustrated Price, \$2.25.

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delphis nearly a century later. The work in hand give a surcinci-hieror of their growth it pe-sures are such interested details as all workers in disponancies need to know and demonstrates the disponancies of the control of the con-trol of the control of the control of the model as perfect to the people, but also benefits the model as procession by stabilizing the economic position of the average physician. Technique, special types and public problems are servitailed, and it is to be hoped that the book may con-trolled to the control of the control of the con-trolled towards as the control of the con-trolled towards as the term tembersacking and greater. occupantion between the public the physician, and the institution which helps 4,000,000 of our opulation every year

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is between indust. 7 whiles the properties and elemposites of all and gas and their origin, treats enterposites of all and gas and their origin, treats enterposite or all and gas and their consistences and the laws of migration and fearmanistics, and discusses maps and their use, oil seriouses and oil shelds, and the prospecting and development of oil fands are set forth in a popular way and some positeents hillselse are exploded. The chapter on oil fands are set forth in a popular way and some positeents hillselse are exploded. The chapter on oil fands are set forth in a popular way and some positeents hillselse are exploded. The chapter on oil fands are set for the chapter of the control of the chapter of the chapter of the chapter of the chapter of the position of the position of the chapter of the cha

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human strales and molecul mosts opinions. The Sun has reflected and restreet upon our plaintend and social fabric since the days when Neet Yack was no bigger than leastable bloody Prest, he sheet, 'the days of deals, of Davy Crockets, of pige watering to City Hell Park "From Dana down, it has been shaped by, and has in term shaped, many flowmer a far-street and the street of heaped, many flow of the control of colors and as unstained to the street with a weath of order and a senselmed for the street of the foreign that will will be sancy reaches.

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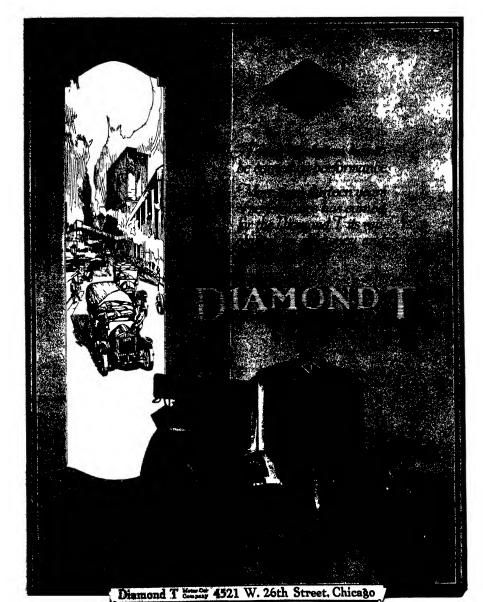
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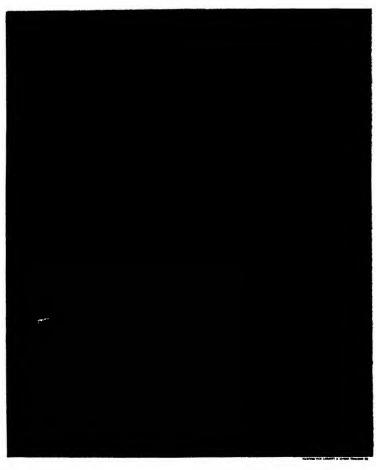
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pages, with their hundreds of pissess of a jewelry. Only workers may follow sury atton from start to finish, jurgal decade are no ally and completely hundred. The first on any proving making, deale with stomes and cutting, with gold and silver, and the pre-tavoived, bronches, near jura, pendents are are created from various meterials, and essas modelling and seeming suphassed. The modeling and desting explained. The section, freaking of destine, includes histori-ment, motifs from meters, the choice of ga-drawing, equipment, and many other con-tions vital to this brench of the subject. Th-is destined to be a source of gasets pleases

The American Rivas. A Treation, a Treat Book, and a Book of Fraction Instru-tion in the Use of the Riffs. By Major Townsend Whelen, U. S. A. New York: The Century Company, 1918. Sec.; 1640 pp.; over \$60 Minor, 1918. Sec.;

Major Windom, a recognizated authority or urine, comes to this seal with all years of using and an unbocunded entalpatent. He has not this a run book, the presiden relative to dryll lo-upon that red-blooked pleaseer period with an expensive the red or explanative when he may an entalpatent that the red-blooked please when the man and the red-blooked pleaseer period with a flavor, to the present, of secondary includes another, presented of the word, highest wakes another, presented of the word highest wakes a radially or market and the red and the state of the red of the red of the red of the controlled the red of the red of the red of the flavor of the red of the red of the red of the discount of the red of the red of the red discount of the red of the red of the red discount of the red of the red of the red discount of the red of the red of the red discount of the red of the red of the red discount of the red of the red of the red discount of the red of the red of the red of the red discount of the red of the red of the red of the red discount of the red of the red of the red of the red of the discount of the red of the red of the red of the red of the discount of the red of the discount of the red of the red of the red of the red of the discount of the red of the red of the red of the red of the discount of the red of Major Whelen, a se





DISCIPLINE—in the army or out of it—
good care of the melves—Even in smoking,
men are coming more and more to apply this
common sense standard

One indication of this is the growing popu-

larity of a common-sense cigarette, such as Fatima For not only do Fatimas please the taste—there are other cigarettes of which this is true—but Fatimas' delicately-balanced Turkish blend does not disturb, even should a man occasionally smoke more often than usual.

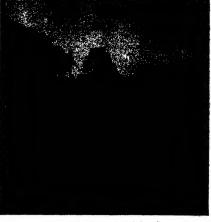
FATI MA

A Sensible Cigarette

SCIENTIFIC AMERICAN







The same road showing what the use of Tarvie-X has done Note smooth, dustless surface

How One Man Carried the Bond Issue

A well known county engineer tells this story, and it s the best good roads story we ever heard

He says the county was in terrible need of better roads The mud all through the district was so deep that it was impossible to use wagons, all traveling being done either on foot or horseback

In spite of the need there was little enthusi asm for good roads when the Board of County Commissioners met Everyone was afraid of the presumed high cost and increased taxes

A farmer in the back of the room arose

Mr Chairman he said I ain t fit to aldress a lignified meeting like this, but that's because I ve halt travel for ten miles over the kind of r 1 is you give us

I c ul in t drive I hal to ride horseback

My boots are covered with mud, my

trousers are covered with mud, my coat is covered with mud, my hat is covered with mud, and if I hadn't stopped to wash it my face would be covered with mud, too

I look as if I had crawled here on my hands and knees, and I m only half through because I ve still got to go back, with five dollurs worth of groceries that I bought from brother Fletcher

If there had been a good, hard road that my old horse could climb up and draw in a load of lumber that I ve got ready, I would have bought twenty-five dollars worth of groceries instead of five dollars worth, and there would have been that much more money in town tonight

And the mud-covered farmer sat down!

Other speakers took up his case They pointed out that good roads were an asset instead of a liability, an economy instead of

an expense, that they brought money into a town and greatly increased the markets.

The result was that the Commissioners enthus a stically passed a resolution to issue bonds enough to give them several miles of good roads.

Today the county is more prosperous than ever, school conditions are better and the amount of traffic going in and out of the town has increased several hundred per cent

The old time hostility to good roads by taxpayers is fast passing away Mud holes may look cheap, but they are the costlest thing any community can have around.

If you will build and maintain your roads with Tarvia you will have dustiess, mudless, frost-proof highways that cost little to construct and maintain

Tarvia has removed the last obstacle to the Good Roads Movement because its use insures good roads at low cost





The Three Big Profits From Good Light

SCORES of careful tests covering a wide range of industry have determined certain definite advantages of correct illumination over the incorrect. Expressed in percentages, proper light means 12% more production; 25% less spoilage; 25% fewer accidents.

The Electrical World recently said, "That good lighting helps to build up esprit de corps seems undebatable. The men are happier, take more pride in their work and in the appearance of the shop, and generally do better all around when the light is good "

Benjamin Industrial Lighting Is a Proved Success

in scores of the biggest and best known plants of today. It is removing the menace of darkness for an army of factory workers.

moving the menace of darkness for an army effactory workers.

Our Illuminating Engineering Department will help you plan a better, and a more economical, lighting installation.

Many foremost industrial institutions have profitably availed themselves of their expert and gratuitous services. Or if you prefer, consult your own engineer, contractor or architect

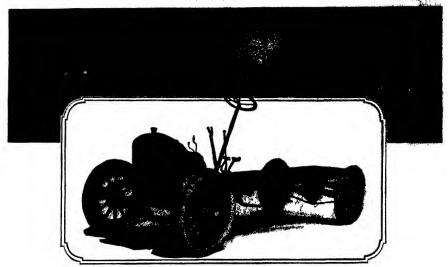
Our Hand Book on Industrial Lighting is well worth while Write for a free copy

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One Government Act Tells the GMC War Story

One Official act of the United States Government tells in the simplest way the outstanding story of GMC trucks in war

When the War Department sought to solve the problems growing out of too many models in motor transport standardized truck sizes resulted

Where no commercial model could be found to fit the exacting requirements government specifications supplied the lack

When it came to the 3/4 1 ton truck there was a commercial chassis ready built

It was the GMC Model 16

It had already been proved in ambulance service on the Mexican Border

It had served the Allies ably in ambulance work before the United States entered the war and was selected by the Medical Department in anticipation of the United States joining the Allies Thousands were subsequently purchased for ambulance service

Later in the war when the Government decided to select a truck chassis to be adopted as Class "AA"

for all military purposes this GMC Model 16, strictly on its ments in competitive tests, in the hands of Government officials and subjected to the most exacting trials, made a perfect score, and it became the official Government standard—picked as it stood

Because of the enormous Government demand our production on this model had reached the point at the close of the war which now enables us, by continuing full speed ahead, to offer the trade this same model at our pre-war price of \$1,495, a reduction of \$250.

This is the truck that made good in France, Beigium and Italy in the days of battle, and it will continue to make good in peaceful pursuits

This history-making Model 16 is but one of six good trucks built in the GMC factory, every one of which has equally as good a record—even though less spectacular—in more than two hundred lines of business—prices reduced on all models.

GENERAL MOTORS TRUCK CO.

Postine, Mich.

Branches and Distributors in Principal Cities



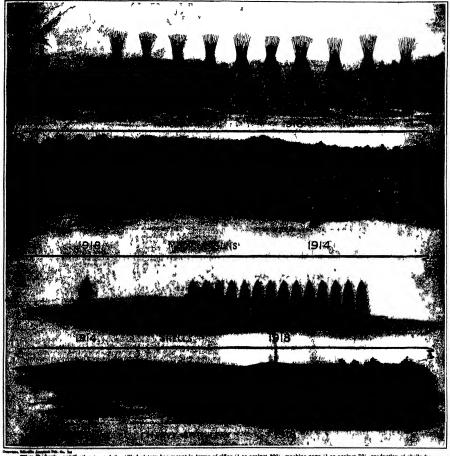
SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CKX

NEW YORK IFBRUARY 15 1919

S N A YEAR



What Printer's contribution toward the Alited victory has meant in terms of rifles (1 as against 290) machine guns (1 as against 70) production of shells for field artiflery (1 as against 14); heavy artiflery or guns over 6 inch (1 as against 20)—[See page 138]

SCIENTIFIC AMERICAN

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### The Peace Conference and the Submarine

I IER much careful consideration of the subject A we published on December 7th an Octavited Abolish the Submarine To those ontified Abolish the Scientific American who have been familiar with the Scientific American it will be un terstood that this call for prohibiting the c reir 1 tim of this type of warship was consistent with om stitude to the submarine for many years past I rom the very first we believed that the fact that the submarine was both blind and sluggish and must in all profability ever remain so would prevent it from becoming a serious weapon of war against up-to-date and well found ships that fight upon the surface of the sea Despite the earn at and long continued effort to remedy these two grave and inherent defects the submarin remains today pretty nearly as sluggish and blind as it was ten to fifteen years go Moreover there is no promise that these defects can be eradicated and until the submarine in the submerged condition (which is its fighting condition) can steam twice as fast as it can today and unless it can see its target with practically uninterrupted vision it must continue to be a failure as a fighting weapon

The great day of tual-the war which was to prove the deadly efficiency of this untried weapon-has come and gone with the result that the submarine as a weapon gitimate war between fighting ships is discredited Furthermore its sile weapon its very raison detre the torpedo to carry which within point-blank range of the enemy it was designed and built has by no means come out of this war with flying colors Even the fast surface boats like cruisers and destroyers with all their ad vantage of speed cl ar vision of the enemy, and ability to mancuver with ramility have failed to get results with the torped ; that incasure up to the great expects tions which were based upon this weapon in pre-wai A notable metan e of this was the cruiser fight in the Bight of Heligolan I cirly in the war when no less than sixty ships all carrying the torpe to fought a furnish action for over helf a day in the course of which somes of turn do s w re fir d without recording a single hit The ships that were sent to the bottom were put down by gun fire

Sy that if the Prace Conference or the League of Nations contains as we are teld it probably will a clause atting an embargo upon the construction and use of the submarim. the science and art of naval design and construction will suffer no serious loss.

On the other hand the peace and security of the world will make an immeasurable gain. The German navy departing from te legitimate held seared upon the submarine as one of its main instruments of terrorism and carried on a campaign of pracy which in the agree to come will be written down and renumbered as the one great German contribution to the traditions of the sea. In doing this she inredictally and very dra-

matically revealed to the world the frightful menace to its security which lies hidden in this most effective wapon of piracy Hence the growing relaxation of the fact both in America and Europe that since the submarne as of doubtful value as a weapon of war, it should be abolished sitegether and the ban of crillisation set upon it once and for all.

We are well aware that in times past it has been fashionable to speak of the subcarame as the weapon of defense and therefore, the felse weapon of the small and weak nations. But we believe there is a consensus of opinion among naval men that the subnarian alone can afford no adequate protection to a coastline against attack by a nary which has a powerful and well-balanced fleet of surface vessels. Admiral Rodman has given us a graphic decemption of the way in which has battle equadron was wont to go out into the North Sea and pair i) in watern that were infected with the subnarians. Not only did his American battleships pass through thrown months of such service without being torpedoed but the capital ships of the whole Grand Fleet we understand suffered a smaller immunity.

If as dispatches from Para seem to indicate the lead in nations ourselves included are, going 1 makes a great reduction in the naval armaments the ples for putting in the bain upon the submarine, be mee of particular importance. For if a nation taking advantage of the particular importance. For if a nation taking advantage of the build a number of submarines far boyond its allotted quots at might preceptate a raid upon the world a more shant flosts under conditions which would give far greater promise of success than those which confronted Germany. It was the size of the Allied flosts and their great alup-building resources which enabled them to build up a vast anti submarine flost in time to meet and master the sudding energence.

And let us never forget that Germany came within an ace of accomplishing her object

### Public Interest in Automobiles

THE decided success of the double automobile show held in New York this week and last us the very best of evidence that ur motor car industries are rapidly coming back to a pose to base. Scarcely another industry was so uper by the war. Although work on motor trucks was intensified by government orders passenger car building was virtually inrught to a standard to provide for the construction of surplanes and other war machinery.

A few months ago drastic restrictions were placed even on the use of pleasure vehicles owing to the neossity of conserving gasoline, and quite naturally all
thought of holding the outstomery annual automobile
show in January this year was abandoned. Even
stee the againg of the armstore it seemed hardly
advasable to revive the show. But the removal of war
restrictions was attended with a remarkable restriction
and with commendable enterprise the National Automobile Dealers. Association votured to stage a belated
automobile show. The response was immediate and
enthusiatic. The old Maddon Square Gardes which
a few years ago was ample enough to hold the exhibits,
soon proved entruly too small for the large number of
manufacturers who wished to dusplay their products, and it
was necessary to use the adjlessor of Armson drawory.

The wisdom of having an automobile show this year is attested by the large and enthusiastic throngs of visitors to the passenger show last week It seems certain that the commercial vehicle show which will be drawing to a close as this is published will be proportionately as great a success.

There was not much in the passenger exhibits that was broadly new, but in matters of detail there were many developments which showed that the progressiveness of automobile manufacturers was not halted by the restrictions of the war.

The most ancouraging feature of the show, however, was the hearty undorsement given it by the guarral public. Motor vehicles hold an undying popular interest A remarkable reaction from the restrictions of the war is shown in the automobile registrations which came to a total on January int 1919 of 364.5422 as against 4 941,376 on January 1st 1918 an increase of close to twenty per sent With such hearty public support there is little to fear for the future of the automobile nuture.

### 'Alcohors and Antennabile

UGGESTIONS have been this that the egustless acquired in the building end operation of shiptime acquired during the west likely maximized beautiful dealing of the state of th

The airplane aggine, owing to its ownerhead valves gase and its relatively loose fitting, is desidedly noisy—a condition which makes it undestrable for automobile use The airplane engine, to save weight, has a lights stank-start of high-class, expensive steel. Under fall power this vibrates, whereas in the automobile tengine it is found advisable to employ a heavier and either shart, in order to minimize vibration. In other woods, it is moden to make much difference whether as attributes assigned barks and vibrates, so it is made noisy and vibrating in order to gain other advantages which de make a difference. But the automobile engine must neither better one shiver, and has to be built with this fact it mind

Agan there is the question of speed. Everybody, know that an airplane engine is much faster than an automobile engine, everybody perhaps dees not realise what a fundamental difference in construction this involves. Thus, carbureton in the strykene engine is such as to afford a very limited degree of Sentiality, while the ground engine must mix the fud property for a wind range of speeds. Moreover, the sirplane engine needs to develop full power at one speed only, while the driver of a car expects has engine to deliver full torque at any speed and without vibration. The shart of the arriplane engine turns at about half the speed shown by that of the automobile engine, making the two quite different as a mechanical proposition.

Nor a speed the only particular in which operation offers on land as against in the air. To adapties angine a slaw of the order on land as against in the air. To adapties angine a slaway supplied with a light, volutile feet alleving achieves and a tevation of 15,000 feet when the conpression area is reduced 40 per cent, the automobile is apposed to handle lower grades of foul withster trouble, and in this regard must always do better in the future than in the past—for high grade gasdines give seasons werey year. Then the airplane engine is treated like a sick baby, getting the most expect attention at frequent intervals. The automobile engine, on the other hand, as usually handled by one who is not a good mechanis, and under all kinds of treatment is expected to musmorbhy for long periods without attention. In addition to this general condition, there is the specific fact that the airplane engine usually operates in a dute-free atmosphere while the automobile is exposed to vast quantities of dust and dirt.

Without becoming too technical for the lay reader, perhaps we can point out that the airplane engine, in order to meet the demand for minimum, weight, is usually provided with steel cylinders, with jackets welded on. This construction is expensive, further, it takes up more heapt than can be devoted to the cylinders in an automobile. Here we have another instance of sacrificong something that doesn't count—height—for something that doesn't count—the thing that dash't count in the plane does count in the automobile.

Two these brief remarks it is plain that for the best results each type of tengins should be considered as a separate problem, and should be so treated as best to adapt at to the conditions which it must meet. There as no advantage to be derived from sying to use she one in place of the other Manufacture of sirplane suppose in place of the other Manufacture of sirplane suppose than the west best of the sirplane of the contrality many automobile shops, beyond quission Further than this we should healthest to go in drawing lessons from the surplane development of the war for application to the automobile

### To Our Subscribers

OUR subscribers are requested to note the empiration date that appears on the wrapper of Southwayse Assentant. If they will send in their received orders at least two weeks prior to the date of expiration, it will aid us greatly in rendering them efficient sevence.

### Dectricity

Impurese Radio Talephone Progress.—An exchange to amount witness and was telephones was established in Rada, Agaza, about the first of the year by the Government Department of Communication, state Wardess (April 62 speech lesses A windows tower 180 feet high is now shong second in front of the largest of the Kobe shappings within a suit of the largest of the Kobe shappings within a state of the largest of the Kobe shappings within a state of the largest of the Kobe shappings within a state of the largest of the Kobe shappings within a state of the largest of the Kobe shapping within a state of the largest of the Kobe shapping within a state of the largest of the Kobe shapping within a state of the largest of the Kobe shapping within a state of the largest of the Kobe shapping within a state of the largest of the largest of the largest of the Kobe shapping within a state of the largest of the l

New York's Folice Wireless.—Acting police commissioner of New York recovered on Decomber 5th last a report of the work done by the wareless telegraph branch of the police department during the past two years. The wireless tower is on the roof of the police head-quarteen building, and the seasons end of the source is shousd the police boat 'Patrol,' which covers the harbor and rurser which bound New York The report shows that merchanduse valued at upwards of \$400,000 and some twenty-five lives have been saved manily through information received by wireless. About \$2,000 messages have been handled by the service Head-quarters has been able to receive messages from a discussion of 1,500 miles, and to transmit them 300 miles

A New Form of Variable Electric Resistance—A recent Germas patent taken on thy L Straser relates to a modification of the type of resatance in which an uron wire enclosed in hydrogen is surrounded by a heating coil. As is will known, a small change in the current flowing through the heating coil can be made to cause a very considerable change of resistances in the iron and such resistances are claimed to have sperial applications for use with machines of very variable speed. The newlify embodied in the patent consists in making the beating coil of a material with a negative temperature coefficient. In this way, continues The Electricion, the beating coil of a material with a negative temperature coefficient. In this way, continues The Electricion, the beating coil can be caused to bring about a much greater change in the from wire resustance, and the sensitiveness of the apparatus is accordingly increased.

Preventing Electrolysis Damage -Various methods of preventing damage by electrolysis to gas and water systems, lead-covered cables, and other metallic subsurface structures are explained in a bulletin announced by the Bureau of Standards Department of Commerce Damage of this kind is caused by stray currents from street radways and is a constant source of worry and some in the larger cities It is said that no complotely satisfactory method of preventing damage by electrolysis has been devised, but the investigations upon which the report of the Bureau is based indicate the m effective methods of dealing with the problem etin is the second edition of "Electrolysis and Its Mitigation," No 52 of the Technological Papers of the au of Standards It is one of a series that is being Bure immed on this subject. Copies may be purchased at 36 cents from the Superintendent of Documente, Government Printing Office, Washington, D C

Renorating Discolored Arc Lamp Globses—At the present time, when are lamp globes in the United Stabes cost about \$2 each, the problem of cleaning up those which have become dirty and discolored with use is worth mentioning. The magnetic arc, with which soul gibbs are largely employed, is apt to give off a metal full which gradually accomulates in the interior of the globs. This deposit on he cleaned off without much trouble with a hittle muristic send. A more serious maker is the discoloration which commonly takes place in globes containing traces of manganese, under the section of light. This discoloration which commonly takes place in globes containing traces of manganese, under the section of the This discoloration is not merely superficial, but extends into the interior of the glass and campit, therefore, be removed by souring. Mr A Hers, in an article in the Electrical World, describes a process of baking such globes at a suitable temperature in ovens whereby, it is atsated, the discoloration is completely removed in the course of about 24 hours. As the entire process, including removal of deposits, cost of gas or more of the section of gas or sected will retain their transparency sufficiently for about 75 per cent of the time during michael and the section of the discoloration being removed by lists the fast of this discoloration being removed by lists the section of the discoloration being removed by lists the section of the discoloration being removed by lists the section of the discoloration being removed by lists the section of the discoloration being removed by lists the section of the discoloration being removed by lists the section of the discoloration being removed by lists the section of the discoloration being removed by lists the section of the discoloration being removed by lists the section of the discoloration being removed by lists the section of the discoloration being removed by lists the section of the discoloration being removed by lists the section of the discoloration being removed by

### Astronomy

A Halium Star with Larje Faralias —Star of the belium type (Type Ho the Harvard system) are usually characterized by small paraliax small proper motion and low radial velocity. A notable exception has been found by J Volte, observing in South Africa in the case of the star Bosn P G C 1517, in Columba for which his photographic measurements give a paraliax of +0.009 sec ±0.000 He also gets for this star the relatively large proper motion of +0.235 sec while R E Wilson, of the D O Mills observatory has determined its radial velocity to be Sa kilometers per second

Messurements of Southern Double Strar—Anotable collection of double star measurements, by Bernhard H. Dawson, has recently been published by the observatory of La Pieta the only observatory in the southern hemsphers, with the exception of that at Johannsburg, regularly capaged in measurements of that kind Mr Dawson's measurements extend from 8 deel 42 degrees southward and eventually the work will be extended to the south pole. The stars were selected mainly from the last of Srr John Herschel sdame-overies at the Cape of (mod Hope The number of Herschel pairs remeasured in this undertaking was 985 and the total number of pairs measured 1,305 and the total number of pairs measured.

Astronomy in British Schools —A committee appointed by the British Astronomical Association to consider plans for furthering the teaching of the elementary facts of astronomy in schools has made a report recommending among other things that the Association appoint a standing committee on this sub-Its functions will be to give aid and advice to teachers in regard to astronomy to draw up suggested courses of instruction to provide lectures for schools, and to keep track generally of the interests of the science in the British od national system tronomer royal Sir Frank Dyson made the elementary teaching of astronomy the subject of his presidential address at the last annual meeting of the Association From this address it appears that the public of Great Britain is quite as deheient in astronomical knowledge as our own He stated that in showing visitors over the Royal Observatory he had frequently pointed out a photograph of the Orion nebula and asked them whether they knew the constellation of Onon The answer was generally in the negative! The speaker expressed the opinion, which we believe is true in America as well as Great Britain that in spite of the spread of general education, the knowledge of the elementary facts of astronomy is less widely diffused than it used to be The use of 'the globes' a regular feature of the oldfashioned curriculum, seems to have a seed out lerres trial and celestial globes a simple orrer; and a small telescope should be included in the equipment of every

The Death of Prof Edward C Pickering deprives America of one who probably ranked as her foremost astronomer and takes from Harvard the second in semonty among her active professors. During his 42 years of service in Cambridge the Harvard Observatory has quadrupled its capital and income and increased in sater ratio its influence in organised astronomy It was largely through Professor Pickering's initiative that the system was built up whereby Harvard kept in correspondence with observatories and private tronomers all over the world to the great benefit f all in the resultant opportunity for comparing and verifying observations and computations. In addition to this he was always a leader in astronomical photogr phy and in the study of stellar light and stellar spe tra Some idea of the scope of his work in these directives is to be had from the statement that during his re od of superintendency the Harvard Observator, has effected nearly a million and a half direct measure sents of the light of stars Part of this work has consisted in a painstaking following of all known variables of sufficient range to make their study worth while so that the Harvard collection of data and photographs is the standard to which all questions bearing upon this important class of stars are referred. The influence of Professor Pickering's guiding hand will be the less missed in that he leaves a competent organisation behind him but his loss is one that American astronomy will long feel. He possessed in the last degree that combination of scientific and administrative ability which is as rare as it is valuable

### Industrial Efficiency

Additions to Department of Commerce of the important organizations in the War Industries Board are, by direction of the President to be turned over to the Department of Commerce These are the Resources and Conversion Section the activities of which will be continued only temporarily and the Conservation Division which will ermanently in the Department of Commerce The Conservation Division of the Wat Industries Board was at first known as the Commer tal Leonomy Board and its function has been the studious conservation of resources and facilities by scientific commercial, and industrial economics The material gathered and the staff developed will on this the Department of Commerce to carry on the work of chiminating waste and promoting precision in business which it has long had in mind

The Price of Raw Materials -We must guard ourselves against motives of fear in the business world states Burwell 8 Cutler Chief of the Bureau of Forcign and Domestic Commerce in a rocent address before the Southern Commercial Congress at Baltimore At present most of our factories and storcrooms are filled with raw materials and commodities which the owners may be tempted to sell at sacrifice prices in order to restore cash balances wholly depleted by war taxes and purchase of Liberty Bonds Precipitate action of this kind if based on a fear that raw materials will generally decline in value will bring individual and national loss The most knowing and deliberate business men realise that the available supply of basic materials for human use and consumption is many times has than the world will need for some years to come. This is the inevitable result of four years of systematic destruction without replenishment in every quarter of the globe

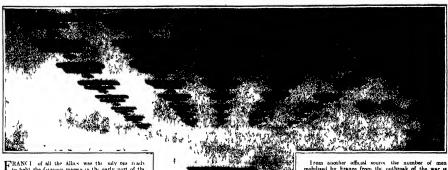
Danger in Next Four Months — The great danger in the coming four months is that there won the jobs enough to go around that unemployment will come with attendant misery and social unrest at a time when anarchistic tendencies are contagous. Let us hope that this situation will not arise but let us quard against it stated Mr Smith at the ricent I alor Reconstruction Conference. The remedy of building public works in and variable to large scale until spring. he continued

The farms will not call urgently for men till frost thaws
out. Building can not for a season be remund to any
great extant. Unefly must we look to our manufacturers
to carry the hurden. But they are bentant. Taxes are
not yet determined. The cost of money is high and
eredit tund for a while. The present or they makeral and
labor are high. The producer hope a that they will fail
and manufacts at undem y to wait till they do. To meet
only of these determent features as an immediate mational

Careless America -According to statistics compiled by the Pulice Department of the City of New York approximately 25 000 persons were injured by automobiles and motor trucks in the streets of Greater New York during 1917 Other cities as well have large lists of automobile accidents in proportion to their populations The strict enforcement of traffic codes and police supervision of the use of streets and highways have undoubtedly, tended to keep down the toll of traffic accidents considerably in some sections but it is plainly apparent that public officials can accomplish but little in accident prevention without intelligent conjugation on the part of the general public and this is largely a matter of educating individuals who comprise the general public to a keener sense of their responsibilities in the matter In an attempt to direct public attention to the enormous loss of life and etherency due to automobile accidents in the United States Mr H S Firestone president of a large tire company has enlisted services of a leading film company to produce an eduentional film entitled Carcless America Various types of automobile accidents are vividly presented on the screen and shown to be due to the care lessness alike of drivers and pedestrians The scenes are most realistic and thrilling N less than nine automobiles are said to have been destroyed in producing the sensational scenes of accidents due to recklessness Through the courtesy of Mr Firestone this film is now being shown without charge in villages towns and cities throughout the United States as an added feature of the regular programs of motion-picture theatres and local enter-

### France's Rôle in the World War

What Our Sister Republic Paid in Life and Treasure Toward the Victory of the Allies, as Told by the Official Figures



Practice of all the allies was the only one read to high the German masses in the early part of the war. This was due to her geographical location and sliso to historical circumstances. The close proximity of the threatning, German I hughry and the recollection of the proceeding was of 1870 71 had made her prepare her armies to defend I reach soil against a Cerman enslaught which was constantly expected
Therefore France's rôle in the common action

gain time while her allies organized and trained their armies the French soldier stood firm while waiting armies the french some room irm while wanted first for the divisions of the British Finjire and then for those of the United States. The victory could not have been won had I rance been unable to hold the line while Lord Kitchener; and later General Pershing were getting their troops in line

As time was working for the Alles those virtues which re commonly said to be characteristically French dash and galantry were no longer sufficient. In such a war patience perseverence and unity were required by the French people who have often been marepresented and believed incapable of a istanic t effort. But since August 1914 facts have sudeed spoken for themselves

Everybody knows how formedable was the flood of

men and artillery pouring through Belgium and Northern mera and actuarry printing unrough needing and Arothorn France after the unsure-solul attack of the I reach in Alsace during August 1814. The mass hurded against the Frunch compared of a but 1 500 000 men with 4 000 field guns 460 batteries of heavy guns and 700 enormous merater. The mass was a second to the compared mortars. This mass was stopped between Paris and Verdun, in the region of the Marne from the 6th to the 12th of September 1914, by the I reach armies of General Joffre with the help of the seven gallant divisions of Field Marshal French I hen after the rush to the see in the effort of each side to outflank the other the new drive of the German army toward Ypres and Calais from the 23d of October to the 11th of November was stopped by the divisions of General Sir Douglas Haig reinforced by the French army corps brought up by Ceneral Foch

Then began the long watch from the North Ses to Switzerland while Lord Kitchener was silently prepuring his armies of volunteers Attacks were delivered on the 9th of May near Arras and on the 25th of September 1915 near Arres and in Champagne by Ireach and British troops in or ler to lelp Russia who was fighting desperately against Corrunation unlaughts. When the Crown Prince attempted to destroy the Iranels at Vordun from Irburary to July 1916 before the British armes could come into line in large numbers he met with armines could come into the mark influences in each way as a vistorious resistance which as Lloyd Coorge has said will ever be imprishable. Verdan savid not only France but the great cause of all the Allies. Because of the battle of Virdan the drive on the Somme during the second part of 1916 was possible the new armies of Kitchener with supporting French troops almost compelling the (mrman army to effect a general withdrawal

In 1917 while successes were being won in the various attacks delivered by the French—the Aisne April 16th and May 5th Verdun August 4th the Aisne October 23d, and in Flanders - the British were gloriously attack ing in many drives between St Quentin and Ypres
At last, in 1918, the French aided the British in

In 1918 the French Army had 40 airplanes to each one in 1914

rapelling the big German offensive of March 21st The order was Stand firm the Yanks are coming A order was Stand firm the Yanks are coming A I reuch commander—Foch—was made generalisamo of all the Alhed armies No one in France lost hope in the ultimate fate of the Republic and her armies al though those days were of the blackest with the Germans advancing over wide expanses of French soil Likewise on the 27th of May Paris was saved by the desperate resistance of the French aided by the heroic troops of resusance of the French aided by the heroic troops of Haig and Pershing. Every fighter knew that more and more American divisions were landing and that victory would belong to the army that could hold out the last 15 minutes After the failure of the German drive of July 15th French and Americans began the victorious rush forward which was to result in the common victory of the Allies and the armistace of November 11th

that was France s share on the Western front richest most thickly populated section of her country was sat rificed as a battlefield for the struggle between the was as rificed as a battlefield for the struggle between the forres of evil and the forces of right. Fvery time the Germann advanced evan a foot that much more of the soil of France was invaside, Tunned despotied Every time a mine was blown every time a shell whether from German or Alled cannon, debonated that much more dainage was committed on Prench property. And bus dreds of thousands of French ritisms awer brought into direct contact and suffering with the forces of militar-sem and those of outraged ovulsation.

ism and those or outraged environments.

Besides all this, France maintained an army of 200,000 men in Salonies after having given her cooperation to the British at Gallipoli. The French navy had already effected the evacuation of the Berbian army of 120,000. effected the evacuation of the personal and without loss from Albania to Corfu where they were re without loss from The navy equipped and restored to fighting form d the transport service for troops and their supattack in Macedonia under the French General Franchet d Esperoy led by Franch and Serbian troops supported by British and Greek troops, broke in the Serbian Serbian Company of the Compan armies and caused their unconditional surrender in a tew days time

Some figures will show the military effort of France 7 700,000 men have been called to the service since 7 700,000 men have been called to the service ance August 1914 Approximately 1 400 000 have been killed and 1 000 000 are dasabled or mussing. In spite of these losses France was not exhausted for she was able to maintain an army of 113 divisions on the Western front until the last days of fighting. At the time of the angung of the armsitos, there were still close to 3,000,000 Frenchmon in the advanced sone of the French front. mobilized by France from the outbreak of the war is given as follows

gven as follows
August 18th 1914 — Officers, 92,828, soldiers, 3,780,000
February 15th 1915 — Officers 97,753, soldiers, 9,000 to February 15th 1915 — Officers, 195,814, soldiers, 5089 000
January 1st 1917 — Officers 115,004, soldiers, 5028 000 January 1st 1918 — Officers, 128,372, soldiers 5024,000 January 1st 1918, the infantry mumbered 2100 775 artiflery, 990,645, avature, 50,285 cavalry 164 422 engineering corps, 185,110
Behind the firing Inn, during the long war, factories were required to manufacture shells guiar machine guiar, and equipment and supplies of all kinds In August,

1914, France had lost first, the region of Briey, riaron secondly the coal mines and the iron works of the northern departments Out of 127 blast furnaces, said a prominent German metallurgist 'only 30 may

said a prominent German metallurgest only 80 may produce page on an a francis handcape—in spite of the lack of coal and or on France was able to manufacture every war material in October 1918, Franch plants were truring out 180 000 75 mm shells per day instead of 13,000 in August 1914 45 000 of the 155 mm shells, seed of 13,000 in August 1914 45 000 of the 155 mm shells aper day instead of 200 60 guns of all cublers were being produced per day 150 to 160 light or 'baby' tanks per month and 7000 avstation engines every 30 days. For every 100 materials which France had at the beginning of the war she had 29,000 at the termination of houtlities. For every 100 machine guns, she had 7 000 Ande from meeting her own requirements, France furmashed 1,380,000 rifles 15 000 automate rifles 10,000 machine guns and 800,000,000 rounds of rifle simmunificial to various

and 800,000,000 rounds of rifle ammunition to various Allies The American Army was equipped with French cannon until American artillery began to flow across the ocean during the closing days of the war France had to croste a heavy artillery from the 300 heavy pieces at to be a newly arthery from the oblinery propers at the beginning of the war, she built up a heavy artillery strength of 8,000 guns, while seading large numbers of heavy guns, particularly 155 mm, to Russen, Roumania and Serbia, and to the Americans in France At the close of hostlines France possessed 17,000 canons, and 8,000 trench mortars and small 37 mm cannon used by

In aviation, France has built up a vast air fleet Starting with 100 airplanes in the French army of 1914, the closing days of the war witnessed a French air force of the cloung days of the war witnessed a French ar force of 400 'machine of the latest 'type. The purmit types developed by the French, particularly the Neuport and the Spad, have been used by all the Alibed armses. Ande from meeting har own demands, France supplied armses arplance of various kinds to be Alies, modularly America. The industrial officit of the Republic could not have a matanack without a corresponding financial effort.

been sustained without a corresponding financial effort Notwithstanding the loss of the regions of the North conventuateading the loss of the regions of the North, which paid 25 per cent of the total amount of Freach taxes, the cutsean of France were in 1918 paying to the State 800 per inhabitant, or \$1,051,73,160 while they yearly paid before the way, 750,77,816. The total war seems of the control of the contro

The three war loans (1915, 1916 and 1917) resided \$5,882,955,780, and the fourth loan of November, 1918,

is still two seconds at this writing to know what it has natural. Through short term treasury bills there was obtained \$4,973,33,007. Foreign countries loased to France \$4,711,720,890-Danjand, \$1,300,390,355, and United Stelas, \$1,811,121,680. The Banks of France and Algoria advanced \$3,502,355,321. Thus there were raised, in all \$24,599,611,190 during the course of the war, which met all the expenses of France of which the total amounts to \$22,646,328,552. In that was which withdraw from the national life all the bast mas, the additivy of the women was one of the most wonderful things France has shown to the world The Franch women, prepared by the powerful feminus organizations which existed before the war, were proposed and were anxious to play their part in the struggle

The Fessoh women, prepared by the powerful feminus cognizations which existed before the war, were prepared and were anxious to play their part in the struggle For educational purposes, thousand of young women took the place of the schoolmatters or of high school professors, 18-50 women taking the place of \$50,000 mm in the subread estimativistics more than 15,000 women in the subread estimativistics more than 15,000 women in the subread estimativistic more than 15,000 women and the commenced houses, large number of women and other than 15,000 women and the women were extensively employed. In the army services and various administrative bureaus, 180,000 women took the places of major the place of major than 150,000 women took the places of major the place of major than 150,000 women took the place of the plac the places of men.

French women have been members of town councils came of them—for metance, Mme Macheres, "Mayor Some of them—for instance, Mme Machera, "Mayor of Soussons"—have struck the German with annasuement by their drumoses and audacity Others, such as the young sebold mistresses, become mayor's secretaries and ruled, to the great wonder of the failing town councils was townships with the same genus as they would their own home. The Franch Red Cross is entirely organized manufactured to the secretaries and the same than the fail of the sound of the sound that the same than to random unitions, wemen were email to the same than the same than the random thous, and the same than the random thous were emailed to the same than the same than the random thous, and the same than the random thous, we were the same than the same than the random than the same than the random than the same than the random than the same 
Thanks to the efforts of the recrease in and the Assistant for Ammunitions, women were email the war industries. To protect them and the Assentant for Ammunicous, wouldn't were employed in all the war industries. To protect them against all risks, to secure them good wages and good health, a Committee of the Work of Women was created whose efforts have brought in the war industries more than 500,000 women

For every two women working before the war there were in January, 1918, 781 in iron works 148 in chemical works, 630 in the transportation business, 161 in woodworks, 430 in the transportation business, 101 in wow-working industries, 111 in the leather industry, 104 in rubber, paper and pastoboard factories, and 102 in various other trades. Altogether in agriculture various ad-ministration bureaus, war industries and so on, more and only wormed were engaged in war work. Thuirs than 1,500 000 women were engaged in war work. Theirs has been a great contribution indeed toward Allied

And it must be borne in mind, when thinking of these And to must be borses in mind, when thinking of these figures, that France is not as big as the United States Great Britain, Austrias or Cermany in point of population the population before the war was between 39 and 40 millions, exclusive of her colonies. But the Republic west to war heart and soul. She put the very best she possessed into the great cause, regardless of cost

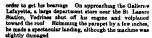
And with the victory won. France is ready to resume her proper piace among the leading nations of the world, with full assurance of a durable peace

### Landing the Airplane on a Roof

To be really practical in everyday life, the airplane must be capable of landing on housetops in crowded metropolitan districts where there is no land available for a flying field. Otherwise it would profit an acrial commuter but little to make a flight of say 25 to 30 miles every day from his home in the country to his

only to have to land at a flying field somewhere outside the city and then have to travel a half hour or more to reach has office

It has remained for Jules Vedrines, the famous French airman, to demon-strate that even the ent-day sirplane can land on a roof if properly handled On January 19th On January 19th last, Vedrines set out from the avia-tion field at lasy les tion field at key lot Moulineaux, not-withstanding a thick fog, and flow toward Paris He flow rather low over the builtwards in



alightly damaged

The roof on which Vedrines landed is 52 feet wide and 75 feet long The machine employed was a Caudron



Caudron after alighting on the roof of a Paris department store

tractor biplane, equipped with a rotary engine. Its Its span

Vedrines won a prize of 25 000 france (\$5 000) for eing the first airman to land upon the roof of a house during a flight

### The Sighting Problems of the Aviator

ONF of the greatest difficulties experienced by serial fighters when machine guns on airplanes came into general use was to bit the inrict aimed at I his may seem to the uninitiated like a bold statement of poor marksmanship but in reality it is not. As a matter of fact to bring down an enemy machine without specially designed sights is nothing more nor less than pure, lulterated luck

I or instance, imagine two machines passing each other tor instance, imagine two machines passing each other along parallel lines 100 yards apart cach traveling 100 miles per hour You are (quippid with a machine gun fring 700 shots a minute-11 each second-the bullet traveling at the rate of 4 960 feet per second If you cook a dead aim at the eneury machine your first bullet would miss its mark by 18 fect and the second bullet, coming ft of a second behind the first one, would miss its mark by 45 feet

To offset this, and to make arrial fighting more of a science, ring sights were divised. These sights con-sist of two rings, a small one representing the bull s eye and a larger one encuring it representing the line of flight of the bullet If aim > taken when the enemy

machine is crossing the outer circle (the hostik aircraft boing 100 yards distant and traveling at the rate of 100 miles per hour) the builet would reach it as it enters the smaller ring constituting a direct hit

But this only compensates for the speed of the enemy machine You still have to make allowance for the speed of your own machine. This is done by means of the Norman Compensating Foreight a head sight fitted to a swivel with a wind-vane swinging in one side which raises and lowers the head and revolves on its axis

according to the pressure of the wind in the slip-stream.

The most wonderful of all sights however is the Aldis Optical Sight used for stationary guns who firing through the blades of the propellic. This sight was in vented by the two Aldis Brothers manufactures of lenses who under subsidies from the British Covern mont have brought the making of light grad kness to a higher point than the German's finest workmanship

The Aldis sight is virtually a telescope which neither magnifies nor diminishes and which, unlike an ordinary telescope can be used with the eye se eral inches from the end of the tube

When looking through this tube at a distant object the effect is exactly as though one wer looking through a napkin ring—the object appears the same whether it is seen through the tube of outside it—but, apparently suspended in the air is a ring sight. The peculiarity is suspended in the air is a ring sight. The peculiarity is that the ring is seen with its center on the spot at which the tube is pointing no matter where the eye is placed If the eye is moved sideways the ring ppears to move with it through the telescope so bet the direction in which the tube points is always toward the center of the ring

The tube when fixed rigidly to a gun thus constitutes Incutbe when fixed rigidly to a you thus constitutes a sight which offers prictially no ob ruction to the view, and which shows instantly the spot at which the gun is pointing without the necessity of along the eye on a front and back spht. The affect produced on the pilot of seeing an enony machine flying into this ring suspended in mid-art is quite starting. One advantage of this spht is that it can be used with

both eyes open. One eye sets the object and the circle through the tube the other eye sees the object threet. The effect, after a little practice is that the object is seen as clearly as though there were no sight at all

The tube is about three feet long and about three inches in diameter, and contains five specially constructed and arranged lenses

One fact about aerial fighting however which has never been ment oned is that after the first sight liss been obtained, the pilot never uses his sight at all. He watches the bullets—littrally! That is, he watches the tracer ammunition. One in every three shots is a tracer a bullet which trails a little path of smoke, and it is much more interesting to watch the tracers than it is to keep the eyo on the sights. Most plotts would like, to use all tracers if they could for they kill as readily as the regular bullets. But unfortunately, tracer am-munition is dirty and will soon choke the hore of the As it is a great many pilots load their magazines and belts with every other one a tracer though it is strictly against the rules. The temptation though is too great to be resisted

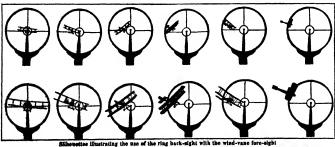
The tracer is made the same as the ordinary bullet except that in the end is a small quantity of magnesium which ignites. It is not quite accurate as it is lighter and drops a little in its flight, but it serves its purpose wonderfully

There is a fortune waiting for the man who can devise a tracer that will not foul the bore and which will

accordingly permit the aviator or in deed any machine gunner operating at short range to em ploy it exclusively

### British National Restaurants

N a statement given out to the press recently, Mr Spencer, director of national kitchene and restaurants of the Ministry of Food in Great Britain, said that the new National Restaurant is now making a profit of \$500 a week In view of its success additional restaurants are being set up in London and in



r is set for the estimated speed of the adversary while the latter automatically compensates for the speed of the plane on merchied. The tipper vow of allocustics is for a range of 200 yards the lower row shows the same objects at 100 yards

### The Service of the Chemist

A Department Devoted to Progress in the Field of Applied Chemistry

Conducted by H E HOWE Chemical Expansion

### Some Non-Poisonous Gases and Their Uses

It seems to be the way of the world that the little sheep of the family shall increase the most publicity and this applies to mid risk as much as to propt. It amy court the way tage in use prepared to this use presentioning gases as used in worlder every if he does no being in the circum met 1 v. be lad who wish if the exclusive might be in public to all your extraordinates and to be a superior of the land of the latter who will be the middle of the latter who will be formed to the latter w

### Quelling Mobs with 'Tear" Gas

As has beer sard previously one and possibly two of the war divel pred gues discrete to be kept as offensive weapons of the liw while substances which product dense volumes of harmless smoke have no doubt come to stay. They are altogether too useful as a reas for operations in the field to be discarded and form an ex-eclient method of defense. The gases to which reference gases Highly efficient gases of each sort which refer field harmful effects are now available for use against mob will be more effective than any other puthod for breaking them up and giving the antividuals something to divert their attention. They will reach where water so often used cannot penetrate and the effect is for a longer time It will be recalled that in the Philippine campaign the Americans were required to fight the fanatical Moro who wilcomed death and conducted a difficult kind of warfare. There was an instance so we have been informed where the warriers used as a shield their women and possibly children and occupied a position such that our troops must kill or be killed gave rise to considerable criticism of our troops and it seems probable that a few gas shells would have made the story quite different. Continual successing and the eyes blinded with harmless tears for a few hours ought to give any fanalu a change and direct his few thoughts into

### T N T from Illuminating Gas

Illuminating gas has been able to play a war part-because of the oil used to earbrive water gas in order to increase its candle power. In many states the heating value or B 1 U (British Ihrmal Units) of the gas is the standard, saves the graviest volume of the gas is the standard, saves the graviest volume of the gas is buried for laciting purposes or in maintic buriers where the temperature of the maintic and not the candle-power of the gas of terraines the illumination. Investigation showed that some 2 per read of the oil added could be received, as colonel which as the starting pount for T. In a serial out that some 2 per read of the oil added could be strong to the starting pount for T. In a serial out that precious hydrocarbon. A number of the strong bard was the strong pount of the T. In the strong the strong was the strong was the strong was the strong was the strong which partly telind per trolcum trackes counter current to the gas subscribing the hydrocarbons formed by the cracking of the petrolcum. Distillation under correct conditions separate out toloud, beared and inspital the oil may be returned to the towers the beared and inspital the oil may be returned to the towers the beared and inspital the oil may be returned to the towers the beared and the end of the strong of the petrolcum of the two treatment purposes.

### Methods of Producing Hydrogen

Balloons played their in pretrait part over there' and a balloon is used so without gas. Not in gos must be beyond that an other and so that the pretrait part of the pretrait part of the gas lived for colors and the another and still be prefeated for colors and the another and still be prefeated for colors and was been the balloon gos and yet it is very highly manimable and even explosive when must with the right proportion of air. The companitive case with which it may be dear and the still be sufficient to the prefeated of the prefeated for the prefeated of t

spong, aron at a temperature of 900° to 1 000° ( where upon the ron takes up the oxygen present to form aron oxide leaving hydrogen of reasonable purity. When the temperature falls hot producer gas as turned in and burned with air in the chamber, during which operation oxide to apong metalle iron again and is self oxidized to a ron when the self-industrial to the s

### Portable Compounds Which Yield Hydrogen

Much work has been done on special compounds which may be transported and easily caused to give up hydrogen in the fild. Hydrolth, for sample, will yield one olbir meter per kilo and with rapidity. It is 80 per cent pure, calcium hydrides and a prepared in the electric furnace by passing hydrogen over calcium in an iron tube. It is showever an expense uncloud.

Hydrogenite will give up 320 liters per kilo — It is 5 parts ferro silicon containing 90 to 95 per cent silicon— It parts sedimin hydroxide and 4 parts wlacked lime. — File reaction is started by dropping in a lici iron slug. — The

Some of the Interesting Characteristics of a Few Gases

| GAS             | Formula         | Trif    | Belling Point<br>atmospher a<br>presente | i rit cal<br>tempg alure | Critical<br>pressure in<br>autospheres<br>of sorpi to<br>resid |  |
|-----------------|-----------------|---------|------------------------------------------|--------------------------|----------------------------------------------------------------|--|
| Acetylene       | Caffa           | 0 9056  | 81.6                                     | 40.4                     | 61 6                                                           |  |
| Alt             | -               | 1 0000  | -191 4                                   | 140                      | 39                                                             |  |
| Ammonta         | NH <sub>8</sub> | 0 5971  | 38 5                                     | 15-3                     | 100 6                                                          |  |
| Argon           | Α.              | 1 379   | -186 1                                   | -117 4                   | 52 P                                                           |  |
| (arton Dioxide  | ( Uz            | 1 52908 | -78 2                                    | 31                       | 72 85                                                          |  |
| (arbon Monos    |                 |         |                                          |                          |                                                                |  |
| ide             | CO              | 0 96716 | 192 0                                    | 137 7                    | 34.6                                                           |  |
| Chlorine        | Cla             | 2 4901  | 33 6                                     | 146                      | 9.5 5                                                          |  |
| Cyanogen        | ( N             | 1 8064  | -22                                      | 134                      | 61 7                                                           |  |
| Hel um          | He              | 0 131   | 26H 75                                   | 207 75                   | 1718                                                           |  |
| Hydrogen        | ff:             | 0 00952 |                                          | -240 8                   | 13 4                                                           |  |
| Nitrogen        | N <sub>2</sub>  | 0 96737 | -195 5                                   | 146                      | 25                                                             |  |
| Oxygen          | 03              | 1 1053  | 182 7                                    | 118 0                    | 49 3                                                           |  |
| Yulphur Dioxide | 80,             | 2 26.88 | 10 0                                     | 157 2                    | 78 0                                                           |  |

Taken from van Nostrand s Chemical Annual

The critical temperature is the temperature below which
gas can be condensed to a fiquid and above which it undergoe

compression without liquefaction in the thought to make a compression without liquefaction in the critical temperature. In just count, to condense the gas to a liquid. When the temperature is lower than the critical temperature less pressure than that indicated will cause this gas to liquid.

action of a rid on metal such as suffairs and on iron, aine or magnesium has been used, but thus is no longer am ployed because of the mountain of raw material needed a small airship of 500,000 cubic feet especify requiring the reaction of about 60 tons of acid with 36 tons of iron to fill it with hydrogen. The latest dimplied is of nearly 5,000 000 cubic feet bengal designed? More recently cleertorlytic hydrogen has couns into prominence especially for the air of possee. A weak acid or alkali solution is authoritied to the suffair of the such acid of the suffair of the

### Cracking Natural Gas to Produce Hydrogen

A novel source of hydrogen is natural gas wholn may be craviced to produce the hydrogen from the methans present if a checker-work of brick is heated hot enough by burning gas and first the sum may be defined in the best as a hydroduc. The gas after may be compressed in the unant manner. When may be compressed in the unant manner. When the same had a six a laking petroleum may be cracked with the same results by spraying the raw material into a property beat of chamber. The temperature of operation has a direct effect on the yield and purity of the gas.

Hydrogen is sometimes produced from water gas by the fliguration of the cabon monoxide. By using this earben monoxide for fuel, enough power is produced to operate the plant the labor charge is relatively small, and at Ferrari, Italy, where the Linde-Frank-Catro process: a operated, hydrogen of 97 per cent to 98 per cent jurity is made at a cost of about 25 times the cost of water gas are required to give one of hydrogen and any earbon duxide is removed by exclubing with water under pressure. As an added precaution a solution of sodium hydroxide may be used to take out the last of the catron disords may be used to take out the last of the catron disords.

### Cutting Metals with the Oxy-Hydrogen Torch

The important uses of hydrogen besides acconsisting are in combustion such as the cxyl-hydrogen flame and the lime light, in synthetic ammonia, as an inert alugabler and in oil hydrogenation. That used in acconsisting the might form compounds determinated to the ballion labric while each 1,000 cubic feet should lift a minimum of 68.5 pounds. A practical billionist will judge the ballionist will judge the

Neithetic ammonia will be discussed another time hydrogenation is one of the bissings which one proferrais writer claimed for the military party, helding that without cheap hydrogen required for Expedition or progress could have been made in changing dete said citility, on the steerle cast, (rilled, by the add to no of hydrogen, II, in the presence of a catalyst. The hattory of hydrogenation hardly switness the argument. The process has become one of much economic importance and is just starting.

### Habum from Natural Cas

More recently it has been found that some natural gas contains a rar gas, heltium in much larger percentagina does are or any other source and this gas possesses the distinct advantage for balloons, of being non-inflammable. The various properties have been known for some time, but the large amounts of air which had for some time, but the large amounts of air which had contained the large and the large an

whether it would have been so thoroughly tested but for the impectue of the war and indeed the quelkening of many lines of industry, the proving of ideas, the deniration of men winestimas shead of their normal turn contration of new inventions shead of their normal turn. Thus far the 80 02 has not been realized, but about 50 08 has, and when the armsittee was signed some 150,000 cubic feet were ready for shipment. Imagine the sensations of a man used to working with helium at 32,400 a cubic foot upon seeing cylindees holding 150,000 cubic feet. The natural gas relieved of the shium was allowed to evaporate into the mains and was none the allowed to evaporate into the mains and was none the feet of the ship of the shi

### British Ideals of Reconstruction

"Rebuilding the National Life on a Better and More Enduring Foundation"

By C. H. Claudy, Special Foreign Correspondent of the SCIENTIFIC AMERICAN

WITH a reconstruction problem of infinitely greater magnitude than that which confronts the United States, it was only to be expected that Great Britain would be devoting much serious thought and attention to it, long before we of America did more than recognize that we might come face to face with such a problem of our own, after the war. There is nothing surprising in England a Ministry of Reconstruction, in her careful plane, in her able working out of a general scheme and the painstaking attention which has been bestowed upon plans, in ner anie worning out or a general solution and the painstaking attention which has been bestowed upon its details. But to find not only an accurate scientific, exact grasp of the problem in its practical aspects, but ideal of reconstruction may be as surprising to

and an according reconstruction may be as surprising to those who read this as it was to him who writes it. If the average American business man were asked to sum up in a few words his conception of the national characteristics of the average Britisher, leaving out all characteristics or the average intrinsier, leaving out all considerations of national pride, he would in all probability give equal weight to buil-dog courage high tenseity of purpose, infeatibility of will, and a conservation of viewpoint largely influenced by ancient tradition in deed, more British people will admit the latter than boast of the former. When therefore one finds the people of this nation widely wideawake to the fact that the war has presented them with their most tremendous opportunity for a real reconstruction of those features of industrial and national life which have been, at from the American standpoint most restrictive of her trade and industrial expansion, one is brought very sharply to the realisation that the effect of the war is by no means confined to material but spreads to mental and political life

Were this new spirit sporadic and not general it would

deserve in the wapper approach and not get deserve in the attention But it is national, and it is governmental For instance from government publications the following excerpts are taken as beautiful in cone ption as they are practical in application

The idea of Reconstruction of a supple return to pre-war conditions has gradu-ally been supplanted by the larger and worthier idea of a better world after war The experience through which the country has passed has enlarged its sense of what is possible, and at the same time quickened its sense of what is fair and right

Even more illuminating is this (and it ems but fair here to beg the pate seems but fair here to beg the patience of one s readers lest they think this story is visionary and impractical, to say that without this preamble the real vision of what the British themselves think of their own reconstruction problem could hardly be here presented even in skeleton form,

in a scant page of matter) Reconstruction is concerned both with questions which will arise in the natural course in this and every other country, when the nation is switched back into the activities of peace-time and it has to give shape and satisfaction to the strong feeling which has arisen in all sections of the community, among men and women of the most widely differing opinions and out-look, that there is very much to be sahamed of when we look back to the conditions of July 1914, and that out of justice to the living and out of reverence to the dead we are called to rebuild the national life on a better and

more enduring foundation in the bar a vector and more enduring foundation.

These words express better than any of mine, the underlying ideal of reconstruction here in highest it must not be a mere readjustment, or even a restab-It must not be a mere readjustment, or even a reestab-shment of pre-war conditions its most important phase, in every one s mind, is the creation of anew system, a new ideal, a new plan for industry, fer labor and in some lines at least, for government

### ation of Mon in Indi

Practically, the two greatest tasks in any getting of a war-pursuing nation back upon a peace footing are demobilisation and relocation of men in industry. It is such a problem which confronts the United States is such a problem which controuts the Universities of Already our industries are saying to our government, "Just let us alone and we will reconstruct ourselves." Our national idea seems to be to get back to what we were, then to burry up and make up for lost time, but, except in a few scattered instances, rarely is it to remake either an andustrial or a labor pointy The United States Government has no Department of Reconstruction, and as one government official engaged in an attempt to do some constructive work along these lines said to the writer just before he sailed If we lo got a reconstruction policy and start it working it will probably begin to function just after our resignation; that completed staclf1

But Great Britain feels that she faces a much larger problem than is contained in the more demobilization of the armed forces the getting learn a back at paying jobs, the resettlement of civil was workers the releasing her industries from the many g vernm ntal r strictions under which they have had to operate for four long years She feels that there are conditions everywhere which should be changed, must 1 changed. Old ideas must should be changed, must fining a fining a give way. The dation must grip by the board Because it was always so us no long a reseon for its item, as now. And because this clining is no strong every where just as the feeling was so string everywhere the state of the strong everywhere the strong everywhere in the darkest days that Ingland must me so does it seem as if from these three strikes it as the natureton which more than a relocation the distribution of the second control of is more than a relocation readjustment and resultle ment but which is nevertheless tol kept up in a severely practical basis must come a n i h more prespensis much more alive and much n re offi sent industrial mechanism and very laig ly a better social and

### Importing and Distributing Raw Material

The problem in England begins with shipping What ships how many ships for lunging men hone for bringing in food, for importing rew materials for ex porting finished products Next raw materials Leather and cotton wool and metals must be secure I shapped and divided among manufacturers There is to be an

WE wish to direct careful attention to the series of articles from our special correspondent in Europe, Mr C H Claudy which will continue to appear for several months in this journal Mr Claudy has completed his work in England and is now in France The article on the British Navy (Feb 1st) and the present article British Ideals of Reconstruction will be followed by others on British Plans for Reconstruction English Railway Reconstruction From Fighting Line to Factory England's Scheme of Demobilization England's Aircraft Industry, British Munitions Future of British Fluing etc. As our correspondent is following the same general line of investigation in France it will be realized that the whole series of articles will form a valuable compendium of information which will be of the highest assistance in the working out of the same industrial and social problems in the United States - EDITOR

> international acramble for what raw material is available international acramble for what raw material is available or can be quickly produced for the world is short of primary material of all kinds due to the taking of men from production to war lack of fertilizer discouragement due to difficulties of merchandizing during the war etc Industries must be graded according to national importance no less in the raw material short days of reconstruction than during the war the unessential industry must give way to the essential a thing in it self revolutionary in Great Britain in times of peace

> Raw material secured, who shill say in whom it shall go? Government? It might work well in the United States for the United States has only the tradition o democracy behind it. But England is feudal in its generation, and class pride and prejudice are as strong among some as patriotism. If Government interferes among some as patriotism If Government interfere too much in times of peace Government may be over thrown Now, mark the wisdom here shown government has decided not to ration law materials government has decided not to ration law materials ; individual industries, but to industries in a grou Representative Councils made up from both Finployers and Trade Unionists will be citated within the principal industries, and these will decide when rationing is necessary, as between manufacturer and manufacture

> sary, as between manufacturer and manufacturer With shipping, raw material and distribution of raw material out of the way comes the transportation probem, the remaining of neglected roads the future of a rundown railway system already resized to be archaic in many respects if spieadd in others the expansion of the canal system, the development of scral transport and here, too comes in the matter of the dumping of army stores upon the nation and the way for instance in which thousands of motor trucks miles of wire, tons of manufactured articles bought for the army are to be

delivered back to civil life without dislocating the indus-tries and impoverishing the labor which produces such

Next comes the recatablishment of the labor force the transforming of an army of solds results an army of workers. The demobilization scheme has already been taken up by the present writer as handled both at home and here civil war workers reestablishment is a story in itself co peration between employer

But after the labor the material the factory and the transportation are all brought together comes one of the ideals of reconstruction in what spirit is the work to be done? Increase the national output is sing gested by many as the chief ideal of the new order with the idea that debts cannot be paid nor the condition of workers improved nor the cost of living reduced unless the new efficiency of production is held as the first conscieration. But here comes the returning soldier who has sacrificed time sometimes health and always his prolucing force to say that the low paid conditions of an earlier era are gone for good, and that the pre war condition of a continual state of armed neutrality between employer and employed must be altered. And so the British laborer and the British employer are both brought to understand that mereased output and improved laboring conditions must go hand in hand world be youd the sis can here show the way True we have yet to teach it in its entiroty to ourselves, but we have a thousand milustries now where Britain had one before the war where the most ideal of working conditions and the highest of wages have gone hand in hand with vastly increased output and high profits to the

business It took American standardisation and efficiency to manufacture cheap automobiles typewriters harvesting machinery and super-accurate watches at an ab-aurdly low price while keeping working conditions and wages on the highest plane With Great Britain this is no longer a

dream she is putting it into effect Whit is known as the Whitly Committee on Industrial Reconstruction has done a noble piece of work which is even now bearing fruit Broadly it consists in the establishment in the highly-organized and istrice of joint councils of employers and trade unimists They are both national and local to individual industries and in addition they are according to a pronouncement of the Ministry of Labor, "the normal channel through which the Government will seek the experience and advice of industries It is generally held that the establishment of such councils is

the most promising development of the new ideals of re-construction which have come to be as a result of the war, and that there are fou factors which will more happily aid in the solution of the greatest of all problems of the day the labor problem

Amelioration of working conditions has been former a by-word for years Figland s idea now is not amelioration by small changes but a sweeping deal by which the laborer will get what he should have to produce his lost with the greatest hall iness to himself as well as the greatest profit to his enilloyer The whole industrial fabric is being closely investigate and hours of labor wages regulation of earnings health sanitation safety accidents insurance nightwork over-time holidays continuous hours meal times and hours dangerous trades industrial control and child labor are all under the microscope of the Government as well as the scrutiny of those who favor the old system and those who clamor for the new

### A New Rural Life

In the ideals of reconstruction comes a new rural life, better land laws, the use of land for public rather than private interests (a story to be told at greater length later) the reclamation of waste land the parceling of it to soldiers and sailors the increase of agriculture and the diffusion of a new school of thought in old agricultural circles Health, housing and sanitation are receiving attention as never before, and adult education that the nation need not wait on the younger generation for a speedy acceptance of the new ideals of national life has a prominent place in the plans of those to whom British Reconstruction is a gospel of regeneration not a more readjustment of a dislocated empire to its pre-war days



The primitive tanks, holding ten sarks of seed each, used in the early stages

The experimental apparatus used for demonstrating the electrification of seeds

### The Electrification of Seeds

### A Revolution in Agriculture

By Charles A. Mercser, M.D. F.R.C.P., F.R.C.S

FROM time to time arts have been revolutionised I by the ifforts of individual men often men not brought up to the art but practicing in a very different brought up to the art but practioning in a very different coctupation. Arkwight a barber revolutionized the art of spinning. Cartwright i delegionan revolutionized the art of weating. Watt a maker of mathematical instruments. Evolutionized every heavy industri-Rowland. Hill a schoolimater revolutionized our communications by deviung the penny post and Mr. Try an electrical is revolutionizing the art of agricul

For to produce a large increase in the yield of corn and other crops and at the same time a material improve ment in quality and to do this without any increase in the farmer s expense without requiring any additional implement on the farm or any new acquirement of skill or any ad him all expenditure of time on the part of the farmer -this is nothing short of a revolution in

agriculture and this is what Mr. Fry has done
Flectri its has long been applied to growing crops
and has had a decided effect upon them in producing more rapid and more luxuriant growth but to subject a plant to electristy eith r continuously or at intervals during the whole period of its growth requires a con-

siderable supply of electricity and more or less continuous and in it or less continuous attention to apply it over large areas of many neres must necessarily be rostly, and to apply it over hun-dreds and thousands of acres dreds an I thousands of acres is scarcely practicable especially as the installation of wires it to must neces sarily interfer with the operations of agui ulture For horiculture it is no doubt practicable and may be found useful and even profitable but the difficulty of applying it on a large scale to agriculture is evidently considerable and Mr Fry turnel his attention to the ch trancation of seeds which is op it to none of these drawbacks

The process is novel. There was no previous experience whatever to go upon and the inventor had to feel his way gradually to success by the tedrous process of trial and error making many mistakes on the way suffering many disappointments, checked in every direction but the right one and learning from every failure the way to success Beginning hat in a few pots the experiments were soon extended to a patch of garden ground then a neighboring farmaniager was persuaded to so very reluctantly and sorily against the grain, a few plots of agricultural land beeing the results he was less reluctant the next season and as year by year his crops from electrified seed continued to contact favorably with those from untreated need he sowed a larger acreage with the former, until in tach field for comparison and from being an utiler sceptar, h. is become an inthinsiastic advocate of the process

Farmers meet at market and talk about the weather and their crops and thus nows of the process spread in the neighborhood and one farmer after another adopted it first only as a trai, and on a few acres of ground, but when they had had experience of it upon larger and larger acreages until at the present harvest 180 farmers have respect grain growing from electrified seed. I armers are a cautious and conservative race not eager to adopt new in thods until these have been well tried at other people s risk, and have had their value proved beyond question and those who tried the electrified seed for the first time tried it upon a few acres only, so that the total

acreage thus sown last season was not much more than 2,000, but 2,000 acrees is quite enough ground to yield a thorough and satisfactory test, especially when the trails are scattered over many different oparts of the country, on many different soils, from the infertile sands and newly plowed heaths of Dorset to the chalk afound Salubury Plann and the stiff olays of Chashier No doubt much larger acreage would have been newn with electrified seed if efforts had been made to spread a knowledge of its advantages, if the inventor had not waited with the intention of perfecting his process and discovering all its possubilities before taking any steps to make it knowledge. to make it known

But it seems that the possibilities are almost unlimited suit t seems that the possibilities are almost unimited. The more is investigates it, and the wider the scope of his experiments, the greater are the advantages they reveal. As it is quite enough is known, first to prove that the process is one of very great value if properly conducted, and second to enable it to be conducted to conducted, and second to enable at to be conducted to the best advantage, eliminating with certainty all the errors that vitiated the results in some of the early sep-perments and ensuring without fail a substantial is-crease in the crop. This is enough to justify, and indeed to demand, the use of the process. It would be us-justifiable to withhold the process of the pro-cess of the process of the process of the pro-cess of the process of the process of the pro-cess of the process of the process of the pro-cess of the process of the process of the pro-cess of the process of the process of the pro-cess of the process of the process of the pro-cess of the process of the pro-cess of the process of the process of the pro-ses of the process of the process of the pro-ses of the process of the process of the pro-tes of the process of the process of the pro-tes of the process of the process of the pro-tes of the process of the process of the pro-cess of the process of the process of the pro-tes of the process of the process of the pro-tes of the process of the process of the pro-tes of the process of the process of the pro-tes of the process of the process of the pro-tes of the process of the process of the pro-tes of the process of the process of the process of the pro-tes of the process of the process of the process of the pro-tes of the process of the process of the process of the pro-tes of the process of the process of the pro-tes of the process of the process of the pro-tes of the process of the process of the process of the pro-tes of the process of the process of the process of the pro-tes of the process of the process of the process of the pro-tes of the process of the process of the process of the pro-tes of the process of the process of the process of the pro-tes of the process of the process of the process of the pro-tes of the process of the process of th

contains are not yet become available is practice, and the invantor has at length been prevailed upon to piles it on the market as it is. In the first place, there is a notable ingrease in the yield of grain from the slectrified seed. An average crop of wheat is Graet British is about 30 bushble per arm, if pairs 4th to the present of the present Britain is about av pusses per acre, of oats 46 to 80, of barley 32 to 40 bushels. If electrafied and unele are sown separately in same field on the same and treated in every rea unelectrified by fre

and 30 per cent of ing The quality of the





Oats, cabbage and kale grown from treated (left, in co ch case) and untreated (right) seed, under identical conditions

the traverse in weight has ranged reason to the same of the process of the properties of the weight of an average contact which is should 55 pounds, but the portion varietions from this average when the process of the process of the probeamen, seems as soort do potental, but the symmetry variations from this average weight see not wide A poor sample of wheat weight see not wide A poor sample of the bushels as not grant of the bushels as not exceptionally fine ample. It is evident that a gain of from one to four posseds to the bushel may make all the diffusions between poor and good, four poisseds to this bushel may make all the difference between poor and good, bestressing good and excellent but means bester spilling quality, less offial, and more flour per bushel. It may mean all the difference between grain that can be used only for milling and grain that can be used for media.

for need.

Even this is not all the advantage to be gaised by using electrified seed. Besides the investee in the bulk of the yield and the increase in the bulk of the yield and the increase in the weight per bushel, there is an increase in the singlet per pushed, there is an increase in the singlet per pushed. In the first place, the discrimind seed thrown up more straws from each seed than the uncelestrified. In non field of oats the In the first increase was characterised by a previously sceptica expert as "asteunding," for whereas the bulk of the unexpert as "asteumeng." for whereas the buts of the un-electrified seed had thrown up only two straws per seed, the electrified seed thrown up five. In the second place, the straw growing from the electrified seed is longer than that which grows from the unelectrified. The straw that which grows from the unelectrified. The straw is in some cases only one or two inches in other cases as much as eight inches, longer, but in every case the length is increased. In the third place, and this is the most important, the stoutness and the strength of the straw are increased. From this it results that the crop is less hable to be laid by storms of wind and rain hable to be laid by storms of wind and rain In one case the wistions to a farm, who had gone for the purpose of snapestung the electrified and unelectrified crops growing side by side, asked the farmer to show them the dividing line between the two Go and look for yourselves said he "No one but be lind man could full to see the difference And truly; it was O. On half truly is were S. On half truly is two as On half the truly the second to the second to the second the second the second to the second the the ground, laid by the recent thunderstorms. On the other half not a straw was laid the whole crop was standing upright waiting for the reaper

e that have been mentioned are not all the Even those that have been mentioned are not all the advantages that may be gained from electrilying seed corn. It seems that corn growing from see of thus treated is less esseepible to the attacks of fungue sleeness and wireworm than that growing from seed that has not been treated Lattle can be said at present on this score, for the observations are as yet incomplete and experiments are in progress that will test the matter up to the fift. All that can be said at present is that there seems to be a great likelihood that the process is protective against smut, bunt, rust, and other fungus diseases.

So much for the advantages of the process now what of its disadvantages? These are few and can scarcely be considered serious first is that if the process is not properly carried out, the result will be disappointing. This can scarcely be considered a drawback to the process teelf It is a simple process easily per occupying only a few hours, and no more difficult occupying only a lew hours, and no more dimenti-than the process of dysting a parcel of yarn or sterilizing a surgical dressing, but his these operations, it requires the use of a certain tech-nique, and cannot asfely be entrusted to in-experienced bands. Properly performed, it can neither damage the seed nor fall to enhance its

Secondly, the effect produced upon the seed is

Secondly, the effect produced upon the seed is not permanent, it will retain its enhanced efficacy only for about a month after electrification, only for about a month after electrification, that the seed he sown promptly after it has been that the seed he sown promptly after it has been that it not known and ellowed fee, it may lead to datapoint the seed and the seed of the



Seed being dried in a kiln after electrification

stood, but at present we cannot say beforehand whether the crop will be greatly benefitted or only moderately benefitted

The process is very simple in principle though it requires a good deal of care and of equire ince in carrying it out. A current of sleatiesty cann it be passed through a heap of dry seed, the grain must lesteeped in water that contains in solution some sait that will act as a conductor Such a solution is placed in a tank the seed is steeped in it and a weak current f cleatricity is passed by means of electrodes of larg surface attached to two opposite end walls of the tank. The seed is then taken out and dried

out and dried. This is the outline of the process but the outline needs a good deal of filling in the kind of salt employed to enable the water to crident the decrease, it is not without important. Sed that is to so sown on one kind of all will visib better regular with a calcium salt and sed I that is the sawn on another kind of soul will visib letter results with a sodium or some other milt. One kind of seed will need texture the soul many the solid many than another will need texture the few many him. with a social or some oracle sait the kind of seed will need treatment for so many hers and another kind for many more or fewer black for makin meeds twice as long treatment as wheter each the atrength of the solution and the sit night of the current atrength of the solution and the stringth of the current must be appropriate and are not no essent) the same in each case. The drying is very important. The seed must be dried at the right tenj reture nother too rapidly not on slowly—and it must be dried to the right degree mather too much nor ter little.

All these matters are important and it is possible that variations in them are resp nell for the variety in the results that are obtained | 11 | r | r (restment bas is experiments with e ascertained by long and each kind of seed and it is only by legrees that the which have now been in progress fresh or seven years



The Fourth Street Bridge, San Francisco, raised to its full limit

It will take many years before all the ben-efit that can be obtained from the process is finally arrived at At present, it has been worked out only for wheat, oats and barley but experiments have shown that its advantages extend to many other kinds of seeds. Turnips and other roots, muze rice cabbage and many other plants grown from seed are known to benefit but for these the process is not yet recommended because the exact conditions have not been thoroughly ascertained results have been obtained from electrifying seed potators but the results are not vet sufficiently uniform to justify its

application on a large scale to potatoes
Electrin ation of seeds will be adopted
on a very large scale in I agland for next
years harvest Every farmer who has tried it once upon a small acreage will use it freely and though it has scarcely been

farmers talk to one another they advertised at all saverined at an narmers tast to one another they see the articles written by experts who have inspected the crops and the amount of seed that will be feet trified for next years harvest will be practically limited only by the pacity of the plant laid down for the purpose In Great Britain the proce cstablished

So emphatically true is this that Dr Wray the United States Inspector in Charge in Creat Britain, after an extended tour of inspection of farms has advised his Covernment to have immediate trials made in every State of the I nion. To my mind the time for trials is past. Further trials are but waste of valuable time. We must face the fact that there is a shortage of food. all over the world and that this shortage will be most acutely felt next year. It is next year that the increased production will be required, and further trials which could till us no more than we know already would only postpone the adoption of the process for another year It is wanted now, and badly wanted

### A Well-Equipped Lift Bridge

NUMPROUS and novel safety precautions are taken in the operation of the Fourth Street Bridge in San Francisco by interlocking the motor brakes and end lock gates in such a manner that it is impossible for the operator to start the motion of the bridge until the end and safety gates at each end have been lowered Until all four and gates are entirely down it is impossible to make the electrical connection with the motors that

to make the electrical connection with the motors that raise the bridge.

After the bridge starts to rise it is impossible for either of the four gates it is le raised until the bridge is again I wred and locked. While the bridge is up it is impossible to make electrical connection with the motors that raise the gates
One of the most novel features of this bridge is the

operation of the semaphores placed at both sides of the bridge to warn navigation officers of the of the bridge to warn navigation officers of the position of the bridge at night. The semaphore consists of a semicircle lens out half of which is red and the other half white. An electric lantern is proved so that when the bridge is down it shines through the red section of the lens which is the danger sign notifying navigation that the way is not clear. When the bridge is raised the simaphor will take such a position that the lantern will shim through the white ction of the lens informing navigation that the way is clear

The locking device can be seen in the photograph A motor operation a shaft that extends across the end of the bridge and by means of eccentric connections it can be looked or unlocked by operating a switch in the bridge operating. ators room It is impossible to unlock bridge until all four safety gites are down It is also impossible to operate the motors that raise the bridge until the tridge is unlocked. When the bridge is unlocked connection can be made with the bridge raising motors

An automatic cut off or short-circuiting device is provided to set the brakes when the bridge in oning, reaches a nearly vertical position and in closing, a nearly horizontal position

A series of electric light indicators tell the

contion to the operator of the bridge at various stages as follows locked unlocked bridge fully closed, bridge nearly closed bridge nearly open bridge free and also when raised to the proper position to permit boats to pass

An unusual feature is a life saving apparatus maintained at this bridge, to save people who may jump or fall into the river at this point







Cable Mountain, Zion Canyon



A vista through the trees of Angel's Landing

### Zion Canyon and the Colob Plateau

A Little Known Region of Southern Utah Destined to Become World-Famous By LeRoy Jeffers, FR GS, Secretary Bureau of Associated Mountaineering Clubs of North America, etc.

A I THOUGH a hundred miles distinct from the nearest railway the Zion National Monument in southern Utah is destined to be visited by an increasingly large number of travellers. I eaving the lost angeles and Salt Lake Railway at 1 and one may trivel by auto across the desert to Zion Canvon by way of Cedar City On the deer(1) Zion Canvon by way of Cedar vity. On overwhan it is saye brinsh greamwool rabibly brash and shad sasle while the prickly | car licens the landwape, with it bright imagenta flowers. lack rabiblis and prairie dogs run to cover as we pass and with the increasing has the air gathers whits of that that rice no columns for two or as hundred fixed in you the floor of the desert and travel randly along for a mile or tvo mountain ranges purile in the distance or louin with deceiving reality in mirage. If one is fortunate he may see a phantom city with its buildings and steeples seeming to b but twenty miles a ross the desert sands cross a ri ig of alm set ; ure iron that is dotte i with cedars white another is com used of likek contacted volcame rock. In the foot bills are great flocks of dirty brown sheep whi h give I und importance as a shipping point

Near (edst (its there are glimpses of red and yellow walls while beyon I we follow for miles beneath the yellow gray and slate-colored chifs of the Hurri canc failt the great st of all known failts in the wild. Or the right are the little known line Valley mount uns while beyon! on the road to St. C. rg. is a brilliant pat h of therry relisand an unmetakable landmark who h an uninerazioni indulura with in secu from the lar listant height of the Colib Platea Ner Foquer ille is a clust r f blaci volcana cones while aby the village lines of varietiere 11 ittes rise one upon another in im sug

After a very steep as out ther opens before us a glorio is vi s temples and butter aglew with marvelous coloring in the a time marveous cooring in the 4 ting sun Towering above is the Great Temple of the Virgin locally known as Steambout Mountain 7,650 feet the highest in the region From the banks of the winding, treacherous Rio Virgin slopes of green lead to a desolate desert region extending to the base of the red cliffs which are dotted here and there with pine and cedar. Then follow vertical walls of gray and white streaked with color from a vermilion butte which crowns the mountain like the upper deck of a steamboat Its brilliant walls are top od by a rich green forest of pines the whole making an unforgetable combination of form and color Iooking upward toward the Colob Plateau we see the most curious red and white domes,

riacian we see the most currous red and white consess, while across the river that enny less of Smithsonian Butte are painted with self-reds and browns. We pass (ration, Rockwille and 'q-ingdale currous old Mormon rettlements of stons and adobe on the banks of the Virgin and of the North I ork near its cultrance to Zion (anyon Tall 1 pollars line the streets through which there flow streams diverted from the river life-giving and purifying alike for man and beast. A new era dawned for the valley with the summer of 1917 when it was first opened to automotiles and fruit and produce were in increasing demand. So important are the scenic wonders of this little known region that in the spring of 1918 the President increased the size of the Monument reservation from 15 840 to 76 800 acres

Near Springdale we have an unequalled view of the Great Temple with its sublime procipies of 2 900 feet

Beyond a canyon on the right is spanned by a natural bridge in process of formation while, on the opposite aide the fantastic Towers of the Virgin astoniah us with sure the innitiative lowers of the virgin astonian us with their unusual architecture and their wind huse of red, of orange and of white. I rom a climber a roint of view, few of the sandstone walls of the valley are attractive during the heat of summer. Circutous routes are neces-sary to reach the summits of these tremendous chiffs and osemite like domes almost none of which have been ascended Viewing the Great Lemple from all sides, one finds it promising only from S. ringdale and, on one of the warmest days known to the region, I found myself far up its heated chifs. Here was a magnificent view of far up it a heated chiffs. Here was a magnificent view of the valler, sinuted in richest browns and reds and en-livened by bright green along the river. Far across the intervening heights were the upper reaches of the Par-unuvear and distant purple capes and headlands lead-ing to the Grand (a non on if he clorated An insuffi-cient supply of water finally forced my retreat to the river 1by far the finest effects in Tonic Carpons are seen at

et and at sunrise Then the great sandstone walls which surround one glow with the most exquisite and unusual colors and one lingers long in worshipful silence

Brown and rod are the cliffs. while above they are cherry and white elsewhere there are mag-enta spaces and lavers of amouth enta spaces and lavers of amouth fresh chocolate seeming as if they were but newly cut Where streams have fallen, the cliffs are seamed with black. But most beautiful of all are the rosy panks which liven the walls, or mingle delicately with the white More rurely there are golden-yellows crowning the white, and complet-ing a color harmony of which one never tires

Awakened in the cool of the morning by the sweet voices of birds, one may gase upward a couple of thousand feet from the Wylie Camp to the summit of a tree-fraged precipies that seems almost to overhang one Proamost 10 everning one Pro-ceeding up the valley one is con-tinually impressed with the amas-ing architecture and sculpturing of the Canyon walls and giant or the Canyon walls and grant buttes. The besuty of the Gothic cathedral is on every hand Here are insistence amphitheatres with coloned buttressee, wast dome-shaped mountains recessed



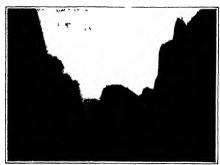
Looking south from the eastern rim of Zien Canyon

with crypts where the rook has shalled of, and Insumerable towers and mires shimmering in pills and in purple. Giant bosses of releved rook overhang royal crobes, and cropped to the complex of the control of the complex face of one greats that is a rectangular decreway, probably 50 feet in hughly which reaemble the entrance to an Expression to the control of the c

The aye, is never weary, for the varied or grosses of the canvon floor of ore pleasing, grosses of the canvon floor of ore pleasing, grosses of the canvon floor of ore present if it embroelsceed with was and yellow columbines. At Cable Mountain are two, 2700-foot wires which bring down lumber into the valley from the forest on the summit Until recently one might make a rs id and rather thillings assents of the mountain by clingmap to the sing on which the timber is severed. One of the most comprehensive views of this

region from above is at 1 let's Font, which is reached by dishibing out of the canyon from the base of Calle Mountain. On the ascent one pusses through a narrow agree with overhanging wells of great beight, and afterward views a mountain of cross-bedded sandstone laid thic figures on a cake I have forced my way up several summits in the wild unmapped country cent of the easyon rins, finding ample overrise, but no water

the easyon rim, finding ample exerines, but no water At Ras intery Bend the river loops between preciations walls and great domes. These are not varied, for below are 3,000 feet of bright red Trassion sandstone while above there is almost the same thickness of white Jurianus and the same sandstone. This in turn is often topped with pink as the bases of the cliffs, for the rushing river has long since taken it away. Down the face of a 2005-foot-fiffs tim waterfall glistens white in the sunlight. Pausing on the cliffs, and the leading 1,000 feet in the wind, it is torn to ribands, and reaches the valley in colored must love and the same than a way toward the distant heathts. Jollowing is the stream in horselock between walls one of 500 feet high that right narrow until the walls of the cliffs.

To the west of Zon Caryon and over 3 000 feet above it, lies the Colo Plateau Probably vasted as yet by less than a core of travellers, it will eventually attract many who seet the finest caryon scenery that Nature has to ofer When I am asted to compare one mountain about the contract of the compare one mountain appeal to the lover of the beautiful and the grand in assure. But when I seek the mountains for my season, I do not feel it has really the compared to the track of the compared to the contract of 


Great Temple, an imposing spot in this remote region

which I am acquainted Consequently I classify scenery according to the grandour of its appeal as primary or secondary I do not attent to compare 7 ann 6 an on and those soon from the Colob Plate in with the Crand Canyon of the Colorado I hes are dissuming in scale but they are each of primary spiral Studying either one does not deaden the thirm of the other.

one was not account the literal of the other care many of the Porte Patters with a loverfol at 10 in the west is a trip of 35 to 40 miles over some of the roughest road of the way is develodly up hill and it we has trip of 35 to 40 miles over some of the roughest road the way is develodly up hill and it we has firmt to enjoy the distant wew of pink and it viringlish in difficult and jury le mountains. The sandstons of the lever Colol as very mountains. The sandstons of the lever Colol as very mountains of the color of t

If was a long hard climb to the Upper Colob but ventually we came to miles of qualting aspens and to the welcome waters of Blue Spring. Here were not flocks of along which pasture on the plateau and annihalate for years all the nitural beauty of the forest. In order to obtain a comprehensive way of the region, we chimbed a datant mountain that overlooks the deep and narrow cleft of the North Fork of the Virgin. On the way we saw white and jink 8 goo libes and greet fields of daudehon and larkspir gleaning like cloth of gold embroadered with blue while in the distance was the rich color of the Pink

From the Blue Spring it is a steep descent though sixto is yillow pine and descent though sixto is yillow pine and distance that the Bofor reaching Potato Hollow we skirted the head of a symmetrically rounded side canvon from whose depths rises a Yosemite like dome. Here, we watched the sixtunded one of the sumet indescriptability blending with the parasite diameters. In the morning we followed the rim of the Hateau four some hours to us farthest extracting those. Zon Canyon It was rough work on horse-back forcing our way through over an unique sixtunded with the work of the property of the property of the way were wonderful views of an immerse canyon located will to the with of Jon Canyon. It has been referred to an the Great West Canyon and through the second of the anti-ferred to an the Great West Canyon and through the second of the second of the anti-ferred to an the Great West Canyon and through the second of the second of the anti-ferred to an the Great West Canyon and through the second of the

to as the fract West Canyon and through it flows North Crees on of the forks of the Virgin No out is known to have putertaid its many miles of spluted security or to have putertaid its many miles of spluted security or to have elimbed any of the rimarkable buttes that rise within it Accompanying us was a famous cought butter who was born on the colob and who introds some day to find a way down the siler chills that guard his virgin cannon. The wholt colob region as well as that west Canyon is as yet uniquely elected slopes and side cannons and from the multiple in detail. Grat West Canyon is a set uniquely elected slopes and side cannons and from the multiple in detail. Grat when the solitical properties of the solitical properties of the solitical properties of the solitical properties. It is wall tell butter have virtual walls of vermillowed out his c acts. It has we from the final point of Horse Pesture is rugged in the extreme. Grat temples and buttes of varied architecture and coloring are isolated by narrow V slappel canyons, while a couple of miles below in the distance we get a glumps of the

green floor of Ziou Canyon
After a rough journey back to the river we left in
the quiet of the evening just as the full moon appeared
above the mystical towers and to mples of the Virgin

### Mending Rail Ends

INSTIAD of cutting off and disarding the wors ends of rails out railrout in the United Stata welfas them into shape again by the unvaictifene process from 1 churry lat 1917 to Max 4d 1918, the ends of a 240 rails in the main line were built up in this manner at a cost of 15 cents jer rail-soul. The material wed is steel obtained from rails, this makes a better lond than the role auxily supplied for coverace/post-state factory failures being few most exceeding two or three per cut.



The view from Colob Plateau, looking northeast toward Elen Canyon



Approach to Zien from the Rio Virgin; Smithsonian Butte in the center

### The New Service Flag

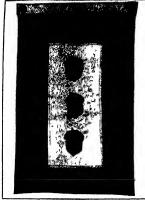
THIC use of a national service flag to honor the mon in our army and many was a very happy thought as was attested by the wide spread and practically universal see of this flag throughout the country although it was in no sense an official flag. I very home which could boost of ablue star was prid. I called the flag in the studies Committed Com

excuse to binu them is way.

A new Hap, how recently impraired which a few companies are displaying. This is a flag which means far more to the company than the former service flag. It is exactly like the old flag except that the blue stars are replaced with khabi, worns. These acoris represent the returned men who have been rematated in their former prostions. A manufacturer can point with far more prick to a flag of this sort than to the old service flag because the new flag is not an innouncement of the fast that he is making good to the near who were drafted into the service whereas the old lag merely represented the handi ap which he had to indure when the men were taken away from him and quiging by the reluctance of so many companies to reinstate their former employes this handicap was not very rate.

### Ehminating Static Electricity in Printing and Weaving

Ohl would hardly connect the work of Thales a Crick philosopher who lived seven contures before Chirat with the most motion in thiod of eliminating actual electricity from 1 per bing printed or loth being word. It it is the principle deserved by hales and understood by Franklin and all his successors in described as ance that like kindes of their current report and other and unlike kinds after at can bother that is the base of the control of the control of the control of their current to the control of the cont



The new re-employment flag

instance in printing on paper and in weaving doths Vidue electricity set up in the abot of paper going through a printing press reduces the output of the press and therefore increases the cost of the printing, because the sheets adhere to the press rolls and to other sheets of paper thereby requiring more handling and a greater time to print any given number of shorts especially when both actes of the about are to be printed. "Smillarly should be about the contract of the printed contract charged with like currents are repelled from each other, resulting in a rough for silver and as unevery year.

The neutralizer shown oradicates these troubles by providing an alternating charge in a conductor placed near the material Whatever charge there is in the material causes the opposite kind to be absorted out of the alternating charge, effecting a neutralization that leaves the material without any charge at all. The neutralizer supplies the alternating charge by

The neutraliser supplies the alternating charge by means of a small motor generator intring out an alternating current of about To-volt pressure. This in turn is passed through a transformer where it becomes a current of high pressure and small quantity ready for delivery to the paper or eloth through a row of metal points anchosed in porcelain blocks marie of the inductor.

her shown Each point delivers a change of the control of the contr

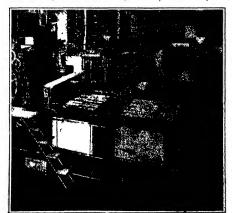
### Grading Small Coal by Air Currents

A PATENTED unspraining appearatus for restairing the dust and fines from the small coed passing pip the washed to the sand these from the small coed passing pip the washed the restaining the coefficient washing the removal of the dust before passing the coal to the washing boxes is absolutely passing the coal to the washing boxes is absolutely necessary, as not only does the dust foul the efficient water, but even when it has been recovered in the form of surry its drainage boxones a serious proposition, so much so, indeed, that at many colliers so entirely a made to wash the dust, which is taken out by a proliminary screening, and then fed in a dry state to the washed only passing to the storage bunker at the creeze. The contraction of the storage to the state of the creeze that the storage that the creeze washed only passing to the storage bunker at the creeze washed to the storage washed to the storage bunker at the creeze washed to the storage washed to

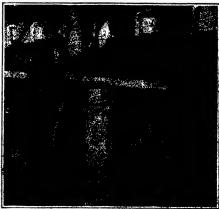
tional dass and mass will be made by passing the effyce over a screen, whatever type that screen may be. The grading of fine coal by means of a powerful current of are it sterefore an interesting departure, which may well have considerable possibilities, especially as the dust stace out by when method will be sommartively free from substances of higher specific gravity than coal.

that only one of the country colliery where a grading plant has comply been untailed by the company fibe coal is dislivered to the washery by a bucket slewator, and dislivered to the washery by a bucket slewator, and dislivered to shaking accesses. The grading appearant is fixed immediately under the delivary shate of the elevator, the nuxel coal allowed to flow over a highed were plate immediately under the plate is an orifice through which a powerful current of air is drawn by means of a centrifugal fan. The sase of the opening is through the control of 
into briquettes

The alternative methods of feeding the fine coal,
arther dry or in the form of slurry, on to the washed
coal are at best dunney and unastisfactory. Assuming,
as indeed is often the case that the whole of the fines
made as used for steam-resump at the works (in which
case they can only be fired in the form of semi-wet
slurry) their increased steam-rasing capacity of fixed in
the form of briquettes would fully justify the initial
capital outlay on the solan:



The device that eliminates static from print paper by supplying a neutralising charge. Inductor bars at A and B, transfermer at T



Inductor bur (A) and suite (C) of the static neutralizer, as leading over

# The Giant Blacksmith who works for the world



BILLINGS & SPENCER forging is hand wrought as truly as the horseshoe on the blacksmith's anvil

147

But modern science uses, instead of the hand hammer, a great drop hammer which crashes a ton blow down on the white hot steel, again and again, with stupendous force until the forging is perfected

Instead of the approximate exactness of anvil forging, Billings & Spencer first cuts a master die out of solid steel—and it is the exact form of that die, gripped in the de scending ram of the hammer which gives every forging shape—which makes every forging exact to the hair's breadth of an inch—which gives every forging such strength as only a Titanic blow can attain

All the care of hand work—with greater exactness All the care of hand work—with the economy of modern quantity production All the care of hand work—with half a century of knowledge, half a century of supremacy

That is why a giant blacksmith has come into being who now works for the entire world

In all the days since the Civil War, Billings & Spencer forgings have been making possible great industrial achievements, have been taking their part in industry's steel skeleton all the world over

It very Triangle B product is the expression of the Billings & Spencer creed, "Into every forging goes our entire reputation



The

# BILLINGS ESPENCER CO. Hartford

The First Commercial Drop Forging Plant in America

Drop Forgings & Hand Tools & Forging Machinery

### The Motor-Driven Commercial Vehicle

This department is desired to the interests for an analysis of prospective owners of major trucks and delivery magons. The editor will endeavor to answer any parties (title g.t. mechanical features operation and management of commercial motor vehicles

### Climbing Mt. Wilson with a Tractor

A IRACTOR built by a western con errn has performed the feat of ascending Mt Wilson and it is said that this is the first time a trict of has climbed a mountain in southern California a mointain in southern Camorina. In regular road was followed and the machine was litted with ruller fixed wheels, more for the protection of the roadway than anything cle

A stock tractor rated at 10.15 bors

power was used and a h vy load was pulled all the way the trailer and its load wrighed 3 063 pounds. The total dis-tance was 3½ miles at d the time required for the trip was 2 hours 41 minutes run was made on high genr all the way. and the only stop was one of two minutes duration to allow an automobile to pass in a narrow place. At no time was there any overheating of the engine or trouble of any other sort this good result was naturally to be experted in a machine built for heavy hailing and continuous lard work the fuel used was distillate, though the tractor was built to use kcrosene, the quantity consumed was a trifle more than five gallons. Only one pint of water was lost in the cooling

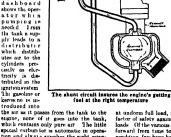
### Non-Electric Starter for Trucks and Tractors

R EASONS for applying starters to motor truck and tractor engines are plenty and sound. The engines are usually big and of heavy construction and difficult, in cold weather, to turn over rapidly, for, in addition to the weight of the parts and the normal internal friction, the oil is thick and heavy and on the get warm a good deal sooner than the engine. There has apparently been hesi-tation about installing electric starters. in these working automatives and though here and there it is done it is so seldom that electric starters are rare except, currously enough, on the smaller trucks where they are least needed

A starter that does not employ electricity, and which has been installed the past six or seven years in many motor boats and airplance in addition to passenger cars, has recently been devel-oped in a form suitable for heavy truck and tractor engines. The principle of operation is simple and direct. Air at high pressure mixed with sufficient gasoline or keroseno vapor to form an explosivo mixture is admitted to the cylinders of the engine, each evlinder getting its charge of air just as the piston s about to start downward on the expansion stroke at which time both intake and exhaust valves are closed Thus th cugane is mad to run much as a steam the eighters much to run much as a steam chaine is run. After a revolution or two, however, the spark occurring in the regular way ignites the mixture and the engine starts and runs and continues to

Air is compressed by a small air pump with a single cylinder which is driven in precisely the same way that a magneto is driven or a water pump or an electric generator. A hand operated clutch is used to throw the pump in or out of gear The air is delivered to a small receiver in which it is stored at a pressure of 250 pounds maximum. The tank has suffipounds maximum. In tank has sufficient capacity to start an engine of average size about fifteen times which will bring the pressure down to about 100 pounds. To restore the pressure to maximum again requires about 41/2

minites pump ing to restore the pressure to in timum nfti i ene start the start in put back into volume of air required for one Sturte consumes about half a minute A pressure gage on the shows the oper-ator when pumping is needed lrom needed 1 rom ply leads to a which distributes air to the cylinders pretricity is distributed in the ignitionaystem The gasoline or



engine, none of it goes into the tank, special carburiter is automatic in operation and always supplies the right quan-tity regardless of the pressure of the air The air pump and distributer are mounted as a unit and together are no larger than

a good sized magneto. The whole of the starting equipment, imituding pump, distributer, clutch tank, piping and all smaller parts weighs about 50 pounds Lubrication is automatic throughout

### An Adjustable Circuit for Low-Grade

Tis concoded that with a constant load kerosene and other cheap fuels would be wholly practicable, but unfortunately, loads are not constant. The ever changing character of the instantaneous demands that the engine is called upon to meet has made the use of kerosene difficult on account of the lack of volatility Being a heavier oil than gasoline, and less

at uniform full load in order to afford a factor of safety against the sudden over-loads. Of the various suggestions brought forward from time to time to meet this condition few have been simpler than the one illustrated herewith

It involves the use of the exhaust to heat the mixture when extra heat is necessary But this is not necessary at all times and when it is not necessary, it would be a disadvantage to have mixture too hot bo an automatic shortmixture too hot so an automatic suor-circuiting arrangement is provided, whereby the mixture circulates past the exhaust when it needs the heat from the exhaust and steers a careful course clear of the exhaust when it does not need that

I his is accomplished by means of a shunt operated from the throttle, as the diagram makes clear Ordinarily the short path from the carburator to the cylinders is open, and the mixture takes it. But when the overload comes, and it is desired that the mixture pass through a heat treatment before reaching the

hable to remain when any in-ducement is offered it to condense, when an especially heavy load denly the kerosene is apt to temperature for the moment is insufficient to keep it in vap-orised condi-tion, and this means that the engine is going to stall

The only remedy as some means of insuring that the mixture shall get the proper amount of host at all times At variable load it must

culinders, the valve is closed from the olinders, the valve is closed from the throttle, and the gas follows the state shown by the arrows in the associal part of the diagram. On this curvell lies a heating chamber warmed by the ex-haust, so when it is diverted over this path, the mixture gets the desired besting. The manufacturers say that long and severe tests have demonstrated the com-plete practicability of their device; that with its use, the engine will run on any kind of a mixture, which need not be studied carefully and need not even be uniform, that even when the engine is more or less out of turn the shunt as so adaptable to conditions that good results be obtained It is to be understood that the shunt is not designed to get an from the necessity of using gasoline for starting—that problem is left to some future investigator. But we are asked to accept this device as an answer to the objection that low grade fuels in a high grade engine give irregular operation

### Finishing Crankshafts

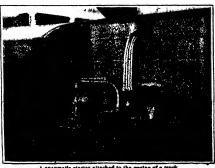
A STRIKING indication of the extent to which specialisation is carried in the automotive industry is found in the fact that in Detroit, the City of Automofact that in Detroit, the City of Automo-biles, there is a large plant that does noth-ing whatever but finish erankabafts. It does not make any erankabafts. Bough forgings are received for shafts for air-plane, automobile, truck, tractor and stationary engines, and those are turner, ground, polished drilled for oil passages, threaded and otherwise made completely ready for untalkation in anomae. ready for installation in engines.

All such work is done to the specificathe state of the circumstances that customers will be exceed-ingly strict in their demands for accurate and correct work and, this being the case, the crankshaft finishing concern has found it necessary to establish a system of gaging, inspecting and checking that is remarkable for its completeness and its working efficiency A crankshaft that is not perfect cannot be delivered because is a a foregone conclusion that it will be-returned as not coming up to specifica-tions, and it will, therefore, represent a dead loss to the finisher—a loss that may be complete, if the shaft is undersuse, or partial if the defect can be remedied by further operations it is a foregone conclusion that it will be

### **Bull Gear Drive Housing**

PROBABLY the most widely used final drive for tractors is the socalled "bull gear" system, in which large gears mounted on the driving wheels or the rear axle are driven by pinions on the final shaft of the transmission. The system has the drawback, however, that it is difficult to protect from dust, leaving the gear teeth open to destructive wear

A western inventor has devised an in-genious housing which completely covers genious housing which compisitely covers the buil gears and pissons and provides favorable operating conditions tending to greatly morease endurance and naturally decrease loss of power The wheel nub used is of special construction, with a cast wheel fiange to take the buil gear and other fianges to take the inner gear and other finances to take the inner eads of the spokes, sufficient metal being provided between the inner spoke finance and the gear finance to take the testion stresses. A easing, preferably of light but strong sheet sized, is readly placed over the rear, dust washers of Felt or other suitable material arring to make tight the joints at the axis on one side and the hub on the other. and the hub on the other.



A pneumatic starter attached to the engine of a truck



### Reconstruction Department

A Department Devoted to the Improvement of Old and Development of New Lines of Manufacture

### Unsafe Safe for Liberty Bonds

to the Reconstruction I liter of the SCIENTIFIC AMERICAN

I note in your issue of lunuary 11th I note in your issue of lunuary 11th
that a correspondent under the heading.
A Safe for Filerty Bonds—says that
the use of a heavy metal se urities hox
would protect the centents may hence thoroughly from bre than do the thin in hoxes on the market you orrespondent is must ken in assuming that there would be any difference of practical value between the fire protecting qualities of a heavy unusubated metal box and those of a thin tin box. We have made many fue tests of sales and similar devices and can say without qualifica-tion that neither kind of lox would be worth anything from a fite protection viewpoint It is scarcely probable that your correspondent had in mind metal thicker than in walls of stoves which every one knows transmit beat readily and on which no one would think of placing his liberty bonds. A box whith would afford some protection (there is no such thing is absolute fire protection) could be made but it would be bulks and heavy because of the heat monlating or heat absorbing materials necessarily used in its walls and it would be in reshity nothing more than a smull sate or insulated cabinet

M I CARR

Underwriters Laboratories

### Letters from Manufacturers

THE Reconstruction I ditor has remanufacturers calling for inventious which might prove profitable to manu-facture. Several of these letters are facture Several of these letters are published herewith. The names of the manufacturers are not given but the letters are numbered and inventors who reply to them should designate by number to which particular letter their replies are directed

We shall be very glad to have you advose us of any matury that you may receive for work in our line

We have a machine shop equipment consisting of some 205 in chaines of various types and classes including planers father millers shapers guinders engraving machines drill presses etc

We are a well established corporation located to a New England scab ard city and engaged in working sheet metals. We are desirous a securing new lines of prohiable business. Only propositions promising steady development will be onsidered Communications drawings data etc will be hell as strictly con-

Many good patents are worked out by men who lack facilities fr properly developing, manufacturing and selling the results of their inventions. This letter is to solicit your cooperation

in having those of your resders com-municate with us, who have inventions that could be made in a factory such as

We have a modern plant completely equipped with machinery, especially selected to produce a variety of articles

The Lelitor is ancrown to help manufacturers who have talk machinery on their hands during this reconstruction period, and who are looking for now arricles auticles for them to manufacturer. I would be the substitution of the substitution of the substitution with the hir of work adapted to their machinery, and from insention, such that the sature of the decree they has to offer Insentions, with working cavity did not support to send complete information about their viscentions, with working own in an article of the substitution of the substitution of the substitution of the substitution of the deliter out forward that makerial to manufacturers who are interested. The actions will forward that makerial to manufacturers who are interested.

both stamped and as-sembled—in sheet metals up to 10-gage in thickness we also maintain a retinning plant and baked cramel inshing plant where we apply plan councils reproductions of beautiful wood grainings or ornamental

Our staff of engineers has had many years of as applied to a variety of industries while our selling organization blankets the entire country If any of your realers

are seeking a manu-facturing and sales connection we shall be pleased to have them communicate with us with a view of taking under consideration prac-



Heat regulating attachment for stoves

Our present line con-sists of lathe and drill chucks, boder and radiator chaplets and nipples, electrical outlet boxes, locknuts bushings, ferrules, metal stam; ings and drawings for the information of those not conversant with the mahinery necessary to turn out the above products in large quantities, we would state that our

mechanical equipment consists of the following Lathes, drill presses, milling machines, grinders, etc. Batteries of blanking, punching and drawing pressos an-nealing and enameling ovens, tapping machines In addition we are operating large electro-galvanising and copper plating outlits. To sum

up, we can make

any article of any

metal whose con

struction in-

heavier than 12-gage material.

A large part of our plant is now idle on account of the completion of government con-tracts and we she wire to take, on so me' patented, whose construc-

es stampings or drawings, not heavier than 12equipment of our type. We might seld, however, that we are prepared to spend whatever sum necessary to buy additional or different equipment, abould the inves-tion possess commercial possibilities selde

This company has been doing business for over a quarter of a century and we believe the reputation we have busin up will be a distinct asset to any propos-

we might go into

We are in a position to go ahead immediately, correspondence on the subject will receive most prompt considera-

### Letters from Inventors

THE Editor has received a great many letters from inventors, coveri wide range, and wherever possible three have been referred to manufacturers who might be interested in them. Some devices do not seem to fit any of the re-quirements so far specified A few of these are published herewith in the kept that they may appeal to some instan-facturer who has not yet written to the Reconstruction Editor

### [Heat-Regulating Attacks

To overcome the disadvantage of having to turn the draft dampers on and off frequently, an inventor has devised a simple heat-regulating attachment, den-sisting of a sheet metal device in which is sisting of a sheet metal device in wheen is placed a damper that is normally held open by gravity. As the stove growshot, the draft passing through the devices increased and this tends to swing the damper into a closed position, as indicated by dotted hines in the sectional

### Snow Attachment for Autom

In order to make an automobile of in order to make an automotion or service in deep snow, an inventor has provided a set of runners adapted to carry the weight of the machine. These runners are flexible and can be flexed by runners are flexible and can be flexed by the ordinary steering wheel to guide the machine. To proped the machine, the tree of the rear wheels are removed and in their place steel bands are made fast, these bands being provided with hooked-projecting members that grip the snow or nor These hooks are flexible so that they will pass under the wheel set tecopies. wheel as it revolves

### Shoe Stretch

Blue Stauechee
The accompanying illustrations of a
new form of abox strucker are suffcompliantory. The devise consists of a
form, preferably made of abest metal,
which is composed of hisped members
that may be spread apart by the turning
of a handle to struck the show. The
devices is arranged to apply presents at
the too, heel, usets, or any other degred
portion, of the abox.

### Improved Calipers

Impreved Calipnes are pictured herewith. The helf-tone lihustration is considered to the construction of t



Converting the automobile into a power-driven sleigh





Shoe stretcher in closed and open positions showing details of construction

metal or largely of sheet metal, need a manufacturing and selling organisation

Inventors destrous of making a connection with a concern for the manufacture and commercial de-velopment of invited to correthe subject





. Two callpars that save time in the



On December 7, 1918, the Allen Property Custodian of the United States sold the entire holdings of the Bosch Magneto Company which have been taken over by an Areican Manufacturing Corporation. The Terronnel was submitted to the Custodian before sale.

THE history of the development of the Internal Combustion Motor is the history of Bosch Ignition. The Bosch is now an American Institution which will necessarily maintain the same scrupulous care in the purchase of materials, the same exact precision which has marked its every manufacturing process and the same exhaustive laboratory and field experimentation which has kept Bosch Ignition in step, without interruption, stride for stride with the motor progress of the world.

There has never been any manufactured article whose reputation for satisfactory performance has been better than the Bosch.

After America entered the war, thousands of Bosch Magnetos—85% of the entire output of the great Bosch works at Springfield—went into vital war service on army trucks, tractors, airplanes, motorcycles, etc.

Bosch now is new only in ownership—it comprises the same active heads that administered the company under the Alien Property Custodian during the war. The Bosch Organization, which from the first has dominated the field of Ignition, enters upon a new era of service to American Industry. Motor triumphs of the future, as of the past, will be built on the firm foundation of Bosch Ignition.

### AMERICAN BOSCH MAGNETO CORPORATION

Man on the state of the state o

Branches-NEW YORK, CHICAGO, DETROIT, SAN FRANCISCO

Service Stations in 200 cities

AMERICA'S SUPREME IGNITION SYSTEM

#### RECENTLY PATENTED INVENTIONS

to counts of the base to the air parameters make a second amounts as the treatment are the results are injusted and attended and the half the underwest and here the treatment of the property 
that in large lab object is modified in making rise in the account of the control BRANT GAGE.—He Trustness to permit an account of the same and the same

or circuit brakers and his particular reference to division of this chancer that are interiled to provide a convenient and reliable means where he can authorized provide an authorized provide on authorized provide on the circuit and so derive the advantage from the strength of adjusted for obligating a reciprocating motion the operation current passing through the direct.

#### Of Interest to Farmers

FENCE POST BASE—W T BENNETT JR BOX 54 Cope Colo the invention relates to tubular reinforced courts bases or so kets for receiving a fence post or the like The prime



A HORISONTAL ASCTION OF THE PASS

object is to provide a past base of such form as to drain and be afforded ventilation wheeby to prevent accumulation of molecuru that would result in the rotting of the post A further object is to provide means in the form of a set screw and consent works whereby to firmly secure the post in the base and provide air space secure the post in the base and provide air space

#### Of General Interest

FILTER —G Care Sa San Antonio Texas
The invention has for its object to provide a
dayloe especially adapted for removing impurities
from gasolent and oil to fit the gasoline or oil for room gastless and on the tree gastless of compact of upper and lower accions the upper action thing within the lower and lower and lower appearing into the lower action the filter units having dicharge pipes extending through the nippies and a casing session in the upper section having a perforated bottom.

SAPETY ATTACHMENT FOR BREASTPINS AND THE LIKE —P F I MNON Abertrom his N D This invention relate particularly to breastpins and the like the object being the provision of simple and positively acting means in securing pins of articles of this matur, where by as a guard and prevent accidental



RECENTLY PATENTED INVENTIONS

Persialing to Apparel

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Electrical Devices

Electrical Devices

ELECTRICALLY BRAID CLOTBING

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AN BLEVATION OF JACK PROVIDED WITH INVENTO and inexpensive movement which is particularly adapted to jacks In cases where the mechanical movement is utilized for pumping purposes in place of a hand whoel such as would be provided for a jack a pulloy or other similar element may be substituted

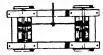
BOAT PROPELLER—J A Presparates, 111 Stewart Avo Carrick Borough Pistaburgh Pa The invention relates to propellers of that type in which blades are attached to rotating shafts projecting laterally from the sides of a bost and below the water line — I be dovice is so ar



SECTION THANSVERSELY TEROUGH THE VES ranged that the blade delivering the force of the stroke will be set at right angles with the line along which it is being forced while the upper blade will be set parallel with that line and thus offer a small amount of resistance as it passes through the water. The propellers may be used in any desired number and driven in a forward or in a reverse direction

FILTERING DEVICE -E E HOWSON, BOX PILITERING DEVICE — E E However, Box one of the property of th

SAWMILL (ARRIAGE—8 Foneyris Davis W Va. The object of this invention is to provide mechanism in connection with sawmiti carriages for moving the carriage interally toward and from the saw as it moves longitudinally



A TOF PLAN VIEW OF THE MECHANISM

In operation the carriage bearing the log is moved toward the saw the engagement of worm wheels will constrain the carriage body to move laterally toward the saw and will hold the carriage in such position with respect to the saw

PROCESS OF EXTRACTIVE SOLIDS—E E Howeve lot 602 Tonaph New Tas Solids are extracted from a supermilip liquid in a manner to provide mechanically a continuity of operation from the beginning to the end An and the solid solid solid solid solid solid solid permit of a continuous operation while persons permit of a continuous operation while persons of a soil and autoenties injudy will be passing though the continuous operation while persons of a soil and autoenties injudy will be passing

#### Medical Devices

DENTAL FIORS O H and E D Ornamon address Gudebrod Bros "Ulk Co 285 Fifth Ave Now Nork N Y The object of this invention is to provide a dental flow which is stosedingly strong and adapted to be passed between the teeth or drawn over the surface for between the teets or drawn over the surface for the purpose of offer they removing extraneous matter on cleaning the teeth. Another object is to provide a floss with a pollabing powder therein to act as a file to facilitate the removal of extran comments and the pollabing of the teeth

#### Musical Devices

Musical Bevieses
AUTOMATIC #10P FOR PILONOGRAPHS

of 11 Assaure 200 Central Park 8 New
York N Y Among other object the Investion
has in view the provision of simple reliable and
inconspicuous mechanisan that recuirse no ad
juguessit or attention on the part of the operator
after it is applied to the machine but which
will automatically stop the motor when the end
will automatically stop the motor when the end
of the read of the control of the record and
which is not subject to premature stoppage from
any cause

#### Prime Movers and Their As

PISTON CONNECTION -E FURRE, JE PITON CONNECTION—E FUTE, Ja., care of Field Artillery, A. E. P. France, care of Fostmatter New York. This invention while with the elements to be driven is more particularly intended for use as a means of connecting the pisson and platen not of an internal combination of the pisson and platen not of an internal combination of the pisson and platen not of an internal combination of the pisson platent to properly all fall field with side direction of thrust and effect an even wear, on the pisson platent rings and cylindra.

DENICE FOR CRANKING INTERNAL COMBUSTION ENGINES — C M RACOME SEQUENCING ENGINES — C M RACOME O M RACOME SEQUENCING ENGINES — C ment of the clutch members. The device consist of few parts and is therefore not easily liable t

#### Rallways and Their Acc

RAILWAYS and Their Accessories RAILWAYS BAIL JOINT—E N WALLACE, Kokomo Ind This invention is an interocking joint or connection between the ends or railwad rails whereby flash plates and new boils are dispansed with greater safety in travel is ob-tained and coronny in time and material is effected. The rail funit complies rail ends pro-vided respectively with a hook and sockety

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METALLIC RAILEOAD FUE — REGISTO
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at the lawing researces growers on its upper
and depth to receive the base finances of the rails,
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for the receiver the base finances of the rails,
and the having commings at search does the growing of the receiver for receiver the base finances of the rails,
and the preventing a need or upward unoverment.

\*\*DESION FOR A FLAD, PERNATT, SIGH,
SIGHLAR RAITEMENT AND CONTRACT OF A

\*\*SIGHLAR RAITEME

JOINTED TOY FIGURE -- I J Rmss. 368 W Passaic Ave Rutherford, N J The object of the invention is to provide a jointed ter fame. of the invanious is so provide a contine toy against arranged to permit of readily and conveniently changing the position of the snovable members to represent the figure in vesticiae artistic, processing or other attitudes or posse. Another objects is the permit the user to readily assemble the puris and to hold the mans in the adjusced position out special fastening devices

TOY —I. R. POGRADEL, 185 Gerfield Ava., Milwaukes, Wis. An object of this havesteen is sometime to what might be termed a shoothing toy as well as a counting toy whereby a double interest is provided. Another order in the provision or means into toy whereby a projected by projected by spring power but released by the band ealther by operating on the projectiled direct or strongth the

SWING—H M WALLER Hawkinsville, On The invention has for its object to provide a swinging device wherein as arc-chapped truck is provided upon which vehicles are adapted to rea-down mes also by gravity and to be propoled up the other side by momentum assisted by the movement of the occupancy of the vehicle

#### Pertaining to Vehicles

SIGNAL LAMP — C B SHEEWOOD Box 284, Cornwall on the Hudson N Y The object of the invention is to provide means in connection with the lamp or lamps of motor vehicles, for



A SIDE VIEW OF THE LAMP WITH PARTS IN SECTIO signaling rearwardly the intention of the driver to stop or turn wherein an auxiliary lamp is mounted at the rear of the usual lamp and adapted to be ignited at will

ATTACHMENT FOR AUTOMOBILES. ATTACHMENT FOR AUTOMOBILES.

It Antension Carroll lows. The invention has for its object to provide mechanism in control of the provide mechanism in control of the control

VEHICLE TIRE—M SCHOOL 10 Weed-court Thrytown N Y This invention resists to a vehicle time of that type embodying a plurality of spring members within a rubber or other case in order to take the place of the ordinary presu-matic tube so as to do sway with punctures, between and other objectionable features A more specific object is to provide a spring device with the desired resiliency so insure easy and emouth running of the vehicle

SPRING FIRE FOR VEHICLE WHEELS SPRING FIRE FOR VEHICLE WHEELS OF DEPOSIT OF STREET, IN Stone Are Recoking N Y An object of the invention is to previde a simple and inexpensive two othe resistivity point which the filter is in the shape of a sectional annulus flattened on the inner surface to provide the uncommy cleanage for the new surface to provide the uncommy cleanage for the careful production of the springs within tend for the accommodistion of the springs within tends. to expand the filler

ELEVATING TRUCK—J WILLIAM 128
Chamber St. New York, N. Y This invention has be in solved the provision of a construction has been also been also been also been provided to the provision of construction to the other with or without the lond A further object is the provision of clevesing trucks wherein the lifting planes may be swanged studen wherein the lifting planes may be swanged studen to the sorvable action or statement.



because, under actual test for a year, the Berling was proved to possess what the Locomobile Company looks for in a magneto

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#### The Current Supplement

ONE of the intenseting problems before the conference at Paris is the dis-position of the German colonial possessions. Sense of those were islands in the Pacific, and with an understanding of German plans for world domination, issue come an expensition of the stress come an plans for world domination has come as appreciation of the strategic importance of these shands as well as their commercial value. This knowledge has aroused considerable, attention in England Deceause of the bearing of the matter on the very un-portain unterests of their native on the very unitered to the state of the problems survoived from a British point of vive, will be found in an article on The Islands of the Pacific in the ourrent issue of the his instructive Assentials Shirt-assestic of the his instructive Assentials Shirt-assestic. of the Scientific American Superment No 2250 for February 15th which con-siders their present state and future im-portance. This is a matter of importance to our country as well as to England both from a commercial and a political stand-point. It seems strange that there should point It seems strange that there should be any part of our country that m not perfectly well known to all of our people by this time but such is the fact The tory of (anyon de Chelly tells of one such locality of considerable attraction both for the archaeologist and the tourist and is accompanied by a number of attractive photographs in How Plonts and Annals Utilize Color a distinguished Franch Utilize (olor a distinguished French naturalist discusses various pigments that protect living matter against radiations Pushing by Machinery tells how the great salmon fishing industries of the Pa coast gather their harvest from the sea, and a number of illustrations show the natur of the apparatus employed The lustrated paper on The Detection of Gh in Prisms in concluded Hying commices the question in relation to meteorological observations

### Absence of Frenks at the Automobile

MPROVISED as the recent Automobile Show may have been, it was one of the most successful ever held. The exhibits were numerous and varied although the novelties and oddsties which generally add color to such an exposition were noticeally lacking. Considered as a were noticeally lacking. Considered as a whole the models shown followed closely the lines of a year or more ago, for it is quite obvious that during the past 18 months the aut mobile designers and manufacturers with their whole energies directed toward producing war materials have had little time to devote to untried changes in motor car construction So they have generally made the present models follow the tried and proved lines of a year ago with here and there a slight

suppressed In other words the pressure of war work has made us a very practical people during the past months of such

effort our time, myn tor efforte on the Liberty and other engines have developed little of the passenger out, for the reason machines and the second second machines depict their similis ance One is a constant spewhile the other is a variable spet The conditions of operation additional

However, if the pa nowever, it the peasurger car am peasure gained much by the war experience of its darigners and builders, the motor trush has gained—and gained a lot. The wast demands of the American Army transport service oreated tens of thousands or money trucks. In meeting the rigid requirements of military service, and in the standardisa-tion of numerous features of design, the motor truck manufacturers have gained invaluable experience which is already reflected in many of the season's offering

#### Some Non-Poisonous Gases and Their Uses

(Continued from page 148)

as 0.00952 and helium as 0 131 It gives satisfactory bouyancy, therefore, and now that we shall have helium available at a commercial price we may expect many uses for it to be discovered, although a supply for dirigibles is not yet in sight.
Then should it be found through this work of securing belium that a method for preducing pure oxygen chemply enough for commercial application has been evolved we will have another reagent of great potentialities. There are some reactions potentialities. There are some reactions requiring the beat of the electric are distinctly and the might be carried out using corygen, when might be carried out using corygen, where electricity is not available or its might prove better technical practice. It is not known just what would be the result if he temperature of the blast furnace sculd be sailed a few date. lew degrees by the use of oxygen, but is might well be that a beneficial revision of methods would take place.

#### Uses of Oxygen

In the gas industry oxygen would make it possible to use inferior fuel in producers and furnaces by enriching the air and it is ften used to melt through stoppages in blast furnaces Oxygen is an aid to varnish manufacturers while its use with acetylene is becoming as widespread as with hydrois becoming as wirespread as wire nyur-gen for autogenous welding and cutting because of the higher temperature attain-able and hence the increased speed of working To cut a manhole in an average boiler takes the effort of two men for seven a year ago with nex and there a sught boder taker the effort of two ness for seven in fact the outstanding feature of this greams is Viv York Automobile Show is the also shirt al senior of freshabi inventions. As a result of our recent was artivited to timp result of discoverers of mechanical features and the discoverers of mechanical features of the senior of less offertively approved in other words the pressure hot fame has a place in every wresters of war work has made us a very practical senior of the words the pressure hot fame has a place in every wresters of war work has made us a very practical senior and the media as a place in every wresters. equipment Its use an medicine r

people during the past months of subactivity, and we have not had time for
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# Don't let your wheels slow up

THERE is big work to be done. New markets wait for those who can deliver the goods. Keep your factory wheels turning and your goods moving. The future belongs to those who act quickly. Pierce-Arrow trucks kept many a factory running bringing raw materials and carrying finished products to market without delays.

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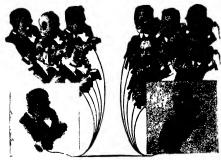
able now to do their part. Our experience is at the disposal of those who need aid in expanding or redirecting their transportation facilities. We know what to do and how to do it cheaply and quickly.

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# Multiplexing the Telephone

Marvel has followed marvel ance Alexander Graham Bell invented his first simple telephone, the forenumer of the millions in use today

In these last four decades thousands of Bell engineers have developed a system of telephonic communication, so highly perfected, that the same crude instrument which at the beginning could hardly carry speech from one room to another can now actually be heard across the continent. This is because of the many inventions and discoveries which have been applied to inter-vening switchboard, circuits and other transmitting mechanism.

The vision of the engineers has foreseen requirements for increased communication, and step by step the structure of the art has been advanced --- each advance utilizing all previous accomplishments.

No one step in advance, since the original invention, is of greater imortance, perhaps, than that which has provided the multiplex system by which five telephone conven tions are carried on today simultaneously over one toll kne circuit, or by which forty telegraphic mess can be sent over the one pair of wires. As in a composite photograph the pictures are combined, so the several voice waves minute on the current to be again separated for their various destinations.

By this wonderful developme the Bell System obtains for the pub-lic a multiplied usefulness from its long distance plant and can more speedily and completely meet the needs of a nation of telephone users.



AMERICAN TELEPHONE AND TELEGRAPH COMPANY AND ASSOCIATED COMPANIES

Universal Servi



# Some Non-Polosmon Gases and Their Upon

ed from page 154)

powder having 33.35 per cent available chlorine and these compounds are mar-keted for the production of small quantiies of the gus

#### o of Liquelying Air

Oxygen for commercial purposes is usually obtained by the electrolytic or the liquid air route. It may be had as a by-product from certain electrolytic cells such product from certain electricity to calls such as these making hydrogen as the primary product or where power is cheap electricity in method may be used with oxygen as the first consideration. Liquid air, which was such a favorite for lecture experiments a short time age has become of superfection time age has become of superfection to the production of pure gases. It may also be used to a limited extent for the attainment of year low temporary of the contract of the contra for the attainment of very low tempers tures especially in accentific experis often with a view to securing extreme dry-ness by freezing out the last traces of moisture

In the I inde process air is first compressed to at and then to 200 atmospheres after which impurities and moisture are removed. It is then expanded down to 40 atmospheres led through a heat inter-changer and thus cooled as returned to the compressor where 200 atmospheres pressure is again secured. This process is repeated until finally some of the air reaches a temperature at which under the pressure it becomes a liquid. I his liquid is allowed to expand in a vessel at atmospheric pressure causing great evaporation of very cold air. This is passed into the heat interchanger to cool the compressed air and about ninety minutes after the apparatus is started liquid air in excess of the requirements of the process may be drawn off Ammonia compressors used to cool the air in commercial plants and calcium chloride is a common drying

The Claude process employs lower ressures while a system of heat inter changers and an expansion engine enables the production of liquid air in a short time Low costs are thus realised but still greate economies in the use of power are claimed for the new Norton proce

for the new Norton process

With liquid air as the starting point it
would seem that the separation of gases
should be as simple as any other fractional
distillation Elaborate restification sysdistillation Elaborate restification sys-tems have been necessary however, in tems have been necessary however, in order to secure satisfactory yields and purity. The boiling point of oxygen at atmospheric pressure is -182.7°C and of mitrogen -196.8°C. Utilining this difference in boiling points modern columns have produced oxygen of 90 per cent. Of the liquefied industrial gases meatinged all are noderline averaged.

tioned all are colorless excepting oxygen which is blue, osone dark blue and air light

#### The Engineering Index

The Engineering Index

THIS compilation, published for 25
years in and by the Engineering Magoine and the successor Industrial Management and universally accepted as the
standard in its class, has been sequired
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could hardly have been mode. Through

(Continued to pain 1997)

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### PATENTS

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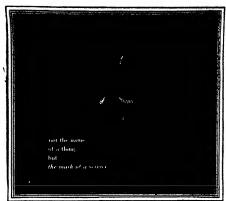
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#### The Engineering Index (Continued from page 156)

library of the Engineering Societies, which regularly receives 1,100 periodicals from all over the world, the Society has unlimited possibilities in the direction of indexing. An adequate schame of sub-head classification has already been worked nead classification has already been worked out, on a scale which makes it plain that the Index in its new dress will be as com-prehensive as could be wished by the most cosmopolitan or the most highly specialised

This undertaking affords but one more demonstration of the inherent soundness of the project which several years ago, housed all our leading engineering organihoused all our seating engineering organisations in the one Engineering Societies Building for the magnificent library which alone makes it possible to undertake an index on such a scale is, in its turn, made a possibility by the pooling of the resources of all the associated bodies

#### Electrolysis in Reinforced Concrete

THE suggestion is made by a French scientist in L Année Scientifique (Paris) that the deterioration of reinforced con-crete may be caused by spontaneous electrolysis. The theory is that dampness and chemical impurities in the water emand the minist impurious in the water em-ployed in the manufacture of the concrete give rise to a continuous flow of local cur-rents which slowly corrode the metal and, rents which slowly corrode the metal and, hittle by little cover it with a layer of oxide 1 ht metal framework thus in-creases gradually in volume, so as finally to exirt sufficient pressure to cause crack-ing and bursting. That the pressure may be very formulable is proved by the follow-ing experiment. In a steel cylinder having an insade diameter of 38 millimeters a steel rod 23 millimeters in diameter is inserted, the free space then being filled with coment The inside rod is then connected with ar electric circuit and the apparatus placed in a tub of water Under the influence of the current the rod will be oxidized and correspondingly increased in size. It will thus oxert a pressure upon the cement surrounding it which will be transmitted to the cylinder, under the influence of this pressure the cylinder will expand and the measurement of this expansion proves that the pressure exerted in a comparatively that he pressure exerted in a comparatively short time is equal to 350 kilograms (770 pounds) It is obvious that even the best cement could hardly resist such a pressure Another experiment, even more striking supports this view A column of coment do centimeters high and 150 millimeters in diameter and having an iron core running from one end to the other was plunged into water A 50-volt cur-rent was then passed through the iron core, which acted as the anode, in less than three hours the column of cement had entirely collapsed

#### Tungsten and the Steel Industry

N the steel industry a number of metals are now used which not many years ago were little known except to students of metallurgy Some of these unfamiliar metals have come into great prominence inctas have come into grate prominence during the war both on account of their being issential to the production of arms ments and munitions of war and also because of the serious problems which arose connected with their supply. Of such metals tungsten is one of the most arose connected with their supply of the most manufacture of steel having the special qualities of hardness and toughness that are required for high-speed machine though the special qualities of hardness and toughness that are required for high-speed machine tools. These steels also possess the valuable property of retaining their hardness, and hence their cutting power, even when heated to redness by the friction of the work which is being performed. The sources of supply of tungsten orse and the production of the metal cross, therefore are of interest not only to those concreted in the great metal and engineering industries, but also to those espaced in industries, but also to those espaced in contract the contract of the press metal and engineering industries, but also to those espaced in the contract of the press metal and engineering industries, but also to those espaced in the contract of the press of the contract of the press of the contract of the cont







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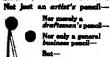






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depends on the existence of the best and most efficient tools and equipment

Tungsten sprang into prominence early in the war because of the ungent requirements for the steel industry for high six 1 ments for the steel industry for high sich machine tools and because it furmished typical example of a key industry monopolized before the war by Germany The story is now fairly well known. If refining of tungeten had been carried or almost exclusively in Garmany From the moment of the outbreak of war the estat habment of a tungsten refinery in th United Kingdom was of the utmost im portance in view of the needs of the fa tories engaged in the production of arm and munitions By cooperation among a number of the largest steel manufacturers in Great Britain this was quickly second plished and regulations were made by He Covernment for controlling the export

Burma was until 1916 the largest pro-ducer of wolfram the principal ore of tungsten Though possessing the richesi tungsten-ore deposits in the world Burma has been handicapped by crude methods of mining and treatment of the ore and by primitive means of transportation mprovements in those matters, however

ave been made recently The keen demand for tungaten led to a romarkable display of energy in the United States in prospecting for new occurrence of ore and in develoying existing deposits in this country. The result is that the United States has outstripped Burms in ore production during the last two years and has also become a considerable ex-porter of tungsten metal and forro-tungsten alloy to steel-manufacturing countries taken place in Japan in Portugal (where the thief producer is a British (ompany) and in Argentina Bolivis and Peru Stimu lated by high prices mining of these ores in the three last-mentioned countries has rapidly extended during the past thro-years the output being shipped chiefly to the United States

Australia is second in importance among British territories producing tungsten ores In Queensland many of the principal mine have quite recently been acquired by one of the largest of the concerns which have established tungsten reduction plants in Great Britain since the war and the event appears to promise a new era of progress for this branch of mining in Queensland Wolfram is mined in New South Wales and Victoria while important quantities of scheelite another ore of tungsten are obtained in New Zealand and in Tasmania Wolfram is also obtained as a by-product of the Cornish tin industry and has received special attention during the last four years (anada has become a pro-ducer, chiefly of scheelite mined in Halifax County Nova Scotia and deposits are also known in Rhodesia

It is difficult to foresse the future tungsten and we do not propose to make any prediction but it is worth while to examine the considerations which would lead one to form an opinion It would be optimistic to expect a continuance of the cages demand and name one prices reassed at times during the past four years. If a general commercial depression and a fall in the world's demand for steel were to take place, tungsten would suffer as would in the works demand for steel were to take piece, tangeted would safe as would many other commodities. On the other hand activity in the works steel fracte and has a we arrect to witness in the future for some time to come should support the position to tangeter a steel handle steel the position to tangeter a steel handle would seen to be established for the present. The possibility pay also be formed in mind that the results of estantific results and the steel steel 
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Among our many standard lines of Superior Machinists Lools, Williams Vulcin Drop Forged Safety I the Dogs ment special mention Their design provides safety - absolute and unqualified because automatic for the operator with maximum strength and better balance on the lathe Foi extreme service they are made with two screws Dogs can be furnished with pro jecting squarehead screws but these destroy the safety feature Bent and Straight Tail Patterns 16 Sizes 1, to 6 inch capacities

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### If the great war had been fought in George Washington's time

Of all the military problems that confronted George Washington there was none greater than that of feeding his arimes

Meat the highting man's most important ration then as now was especially hard to obtain. Much of the time his voldiers had to depend for sustenance on what they could get by foraging

America s job of meat supply in the great war just ended war a thousand fold bugger than Washinations. It was a job of feeding not only our own huge forces here and shroad but the Allied armies as well

America succeeded because she had at her command what Washington didn't have—thousands of prosperous farms and centralized large-scale organizations like that of Swift & Company for the production and distribution of meal

How well America succeeded how well her meat machinery stool the test, is evidenced by a French military authority who not only said that France could not have held out without our support but asserted that the men over there in the French trenches are the best fed men in Europe

To give some idea of the immensity of the food problem—Swift & Company one single month shipped 2012 carloads of provisions overseas valued at

If America had been dependent on the meat supply methods of Washington's time or even of Civil War time it is not difficult to imagine what would have happened

Speaking along this line an American official and that it would have been a super human task to gether and handle the meat meessary to feed the people during this great war if conditions had been the same as they were during the Civil War when the meat industry was scattered all over the country



160

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This is a second revised and enlarged edition of an introductory text that has been in demand for the past four years. Among other ampini-cations and additions may be noted new material cations and additions may be noted new masterial on radioactive phenomena and the modern conception of the atom, the bearing of X-ray spectra or cyristillate form collidated phenomena the Brownian mnveness electromotive force and photochemistry. The work is wall adapted for classes passing from elementary chemistry and physics to theoretical or physical chemistry.

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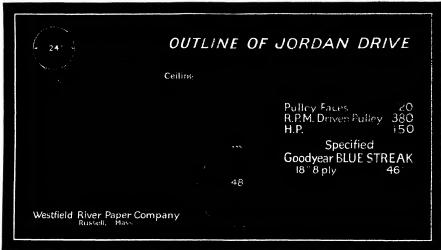
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Even very good belts had proved to be trouble-peddlers on a certain Jordan It was in the Westfield River Paper Company plant at Russell Mass Some of the belts pulled out at the fasten ings and lacings all of them stretched none of them delivered the horsepower needed for that particular Jordan

One day a G T M—our Mr Leddy—called on the plant superintendent and explained the Goodyear plan of selling belts according to prescription instead of as a hardware man sells nails. He was asked what he could do for that Jordan drive He asked to see it and found that it required 150 horsepower instead of the usual 75 to 100 on Jordans. He asked questions and found that it had been built to do a special amount of hard work that neffic ent belts kept it from doing. The G T M made his measurements and started to fogure.

He knew that an 18 inch belt ordinarily should not have more than six plies but in this particular case since the smaller pulley ran at a comparatively slow speed he saw that he could with perfect safety apply an 18-inch 8 ply belt which would do the necessary work Particularly so since the Blue Streak Belt possessed the required flexibility to permit the extra ply under the existing conditions.

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There has not been any trouble on that drive since—although the belt has been working 24 hours every day

Mr Dozier, the plant superintendent, says that that belt is delivering more power than any belt he ever had. He thinks that its excellence is largely due to the friction surface that every Blue. Streak user knows so well. But he admits that most is due to the G T M—to the prompt and accurate way in which his disgnosis of this troublesome drive was made and the correct remedy figured out. So he has had a G T M make a plant analysis covering every drive in the plant and he now orders according to its prescriptions whenever an old belt wears out.

If you have a hard drive that makes belts you always thought respectable act like trouble peddlers, ask a GT M. to call One from the nearest Goodyear Branch will be glad to do so when next he is in your vicinity. His services are free—for the savings he effects for purchasers are so evident and material that a gratifying volume from the plants served is sure to result within a few years.

And when the G T M. calls ask him about how another G.T M
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To the needs of an age of machin ery are added the needs of the period of reconstruction. Building ma terials and metal products of all kinds are needed to restore the wastage of war. The rice mills machinery of China stands beside the American tractors in providing food for the world

For all this machinery correct lubrication must be supplied—that the work







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# Lubricants

A grade for each type of service

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OUTSIDE air that filters through the brick-enclosing walls of boilers costs industrial America many thousands of dollars each year because such leakage cools' the fire kills draft and therefore wastes coal to the extent of thousands of tons in the national aggregate.

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Through a complete line of products listed below Johns Manville can assure plants of new standards of heat saving in the boiler room standards that met and satisfied the Government during the coal crisis just past when tons of fuel were saved and many hours of shut downs averted-at a consequent increase in factory production

Seldom has conservation been better served by Johns-Manville than in this branch of its service

And it can be predicted that the products listed below and the expert knowledge of their application will be of as great service to the nation in this present period of post war readjustment as they were during the war

Because to the progressive plant, conservation has become permanently a national obligation, as well as a business expedient

H W JOHNS MANVILLE CO New York City 10 Factories Branches n 61 Large Cities

These Johns-Manville Products save fuel in boiler-rooms

High Temperature (Refractory) Cements for boiler settings Aertie Builer Wall Cast ng for boiler wall

salithic Baffie Walls—tight durable easy to install; prevent short circuit ng of hot

Through \_\_ sbestos

and its allied products INSULATION CEMENTS

This smell device wes the testing apparatus lest year in hundreds of boiler-rooms at a time when cost say ing was a vital war necessity

Thousands of tons of cost have been saved by prevanting bollar wall leak age and by similar corrective mea sures at and eround the boller furnace

A complete service in this department of engineering was one of the impor-tent contributions made by Johns Manville during the fuel crisis

PACKINGS

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#### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX

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A coal loading and unloading bridge of unusual size and capacity

#### Huge Bridge to Facilitate Coal Handling

THERE was only one way for the industries to counteract the shortage of labor which has been hifting them
so hard during the last few years. That was to dis
cover a methanical equipment that would take the place
of human labor. Almost any inventor who had a scheme that showed signs of being practical had a chance of trial and many devices were brought to light that might otherwise have remained obscure for years

The large essential industries were of course hit the hardest for the demand from the public was insistent while the increased demand to supply the arm s kept

them working at high pressure all time. This was especially true of the coal mine operators who seemed to be hampered at every turn. Here was shortage of labor in the mine shortage. snortage of more in the limit shortage of labor for loading and unloading and finally a shortage of cars. A coal company at Alicia Pa, installed a large and coatly device which helped in this prob lom doing away with a large percin tage of the former labor and doing the work in much less time

the work in much less time. From the mine the coal is brought down the Menongahela in barges and by means of this bridge is unleaded either to a storage yard or direct to the care. The bridge is 455 feet long with a 674 oot cantilever extending out over the river. On the bank at the opposite use of the bridge run the railroad tracks. and cars can be run up close under the the structure At this end of the bridge is the screening equipment so that the coal can be sorted out and shipped in uniform size. The bridge is 110 feet high to the trolley rail makof 55 feet as compared with 3't 40 feet the usual hight of a storage pile. This gives a storage capacity of 301 tons per head foot of do k.

The hoisting is done by a 6 for clam shell bucket with

a pe od of 220 feet per minut with full ad The trolley travel is 1000 feet per minut and the brade 100 feet per minut per minute. The motor c jupic et includes a 2.5 lorge-power motor for hoisting a Holora [wire into I of trolley travel and a 100-liors; pe wit motor for moving the bridge on its runway

To facilitate further the 1 iding a tunnel has been built under the storage yard and a raircud track runs into the tunnel He are are loaded in this tunnel from the cont piles above threigh gates operated by hand from the top of the cars. This increases the loading caractty of the plant as cars can be loaded from under muth while the clam shell tucket operates from above With this storage space mine operators will not be delayed by a scarcity of cars while the quil loading and unliading methods will do away with any congestion of cars at the dock waiting to be filled.
Loading and unlighting bridges are of course by no

means a novelty S mething of the sort is to be found at all large min's and at many shipping and storage pois But the one is a described

stands almost in a class by itself

#### Oil Pipe Line Across Scotland

Till British Covernment has jist completed an eight inch pipe line a ress Scitland. It is rejected that the line was constrained for the jurgos of securing a intinuou adequate supply of full fir the Butish navy with a minimum risk of inteference from

minimum risk of intelerence from on two minimum.

Incline fill we the course of the Clyde and I ith Cunal the starting point being at Old Kilpatrick on the cutskints of Glass, by and the terminal at Changemouth.

Il re are two intermediate | imp mg stations and it has been estimated that fuel cal can be pumped in a cld stat at the rate of 100 tons per hear At the OH kilpatrick terminal 16 large tanks have been constructed on high ing 8 000 tons of oil. At the oth rend the oil is pumped into large reservoirs easily accessible to oil burning steamers at Grangemouth and the Forth ports



The leading tunnel for railroad cars—an unusual feature of the coal yard

# SCIENTIFIC AMERICAN

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Charles Allen Munn President Orace D Munn Treasurer Allan ( Huffin at He return all at 233 Browl way 

The object fill a gentlist ree describely and bundly the litest are tife nehire I and industrial names fithe day. As excelly fit I it is in a post tion to meure intesting livel pments before they are publishe I elseute c

The I fit r in gl I t have submitted to him timely articles and this files clumns especially when such artules it i mpiriell/phtyraphs

#### The Merchant Marine Problem

OR many years past we have been an carnest idy state of an enlarged merchant marine-a muchant marine that should be enumensurate with the great and over growing sea borne trade of the United States In common with every other advocate of a great shipping fleet, we have realized how complicated was the problem, not so much in respect of building as of operating the ships and how difficult it would be to awaken in the American people that enthusiasm for the sea which is absolutely necessary if an adequate merchant fleet is to be built and profitably run

The present revival of interest in our shipping is due to the war, and particularly to the onslaught of the German U-boats. In April 1917, when shipping was being sunk at a rate approaching one million tous a month the question of our building ships was no longer one of thores, but of the sternest necessity Not only did we have to build ships, but we had to build them quickly and to get a big fleet affoat quickly we had to select such types as lent themselves to the most rapid construction Furthermore, due to our neglect of shipbuilding we were without an army of skilled workers and we had to extemporase them. Out of these conditions sprang the wooden ship and our vast army of somiskilled shipbuilders | for you cannot make an expert shipbuilder offhand lie is a workinan whose skill comes only as the result of experience and in some branches of the work of experience spread out over a considerable period of time

Another compelling element in the problem was the necessity for doing whatever we did on a vast scale Consequently quite regardless of cost we rushed the construction of shipbuilding yards larger than any in existence—too large as we now know for permanent ernment gave to labor practically whatever wage it aske I with the result that semi skilled labor in these vards is often receiving pay that is much greater than the income of the average skille | professional man

Non- as a result of these conditions, we find ourselves with a flect of ships large in total tonnage, but very beterogeneous in its inske up. Beggars can't be choosers and with the possible loss of the war staring us in the face we had to commandeer whatever was in sight and build ships that but themselves to stand ardized and very rapid construction. Hence our increhent marine includes a whole fleet of wooden ships The official figures of the Shipbuilding Board show that the United States now owns steamer of a total of two million gross times that we are now building four million gross time and that there are two million gross tons owned by private in hviluals. This means that altogether we have a total feight million tons gross of shipping publicly and privately owned and under construction

But let us be careful here not to be misled. The world at large talks in terms of gross tonnage, a gross ton representing very much more than a deadweight ton and if we wish to have a clear idea of the relative standing of our merchant marine and that of the rest of the world we must think in terms of gross tonnage

The Department of Commerce of the United States uses gross tons, and since a steamer of 6,000 tons deadweight would be of about 4,000 tons gross, the use of "deadweight tonnage," by the Shipping Board is apt to be very misleading. As a matter of fact, our total of 12 millions in deadweight tons is equivalent to about eight millions in gross tons.

Now, with regard to the future, there is no doubt about our ability to build a great merchant marine Further-more there is no question that, if we pay sufficiently high wages and give the crews sufficiently comfortable quarters, we can adequately man every ship But when we come to the question of competing with the great outside world, the problem takes on a very different aspect, and, the prosperity of the venture, if it be left entirely to its own unsided devices, becomes very, very doubtful The only solution appears to he today, as it did ten or twenty years ago, in the granting by the United States Government of a heavy subsidy to make up the difference between the cost of running foreign competing ships and the cost of running American-built and American-operated ships

Somebody, we believe it was Mr Hurley, suggested that we write off the burden of the heavy first cost of our war merchant fleet to the extent of about one billion dollars Coming on top of Mr Daniels request for an addition to our navy which will cost another billion dollars this proposition of Mr Hurley will not be very attractive to the already overburdened taxpaver

If we are determined to have a merchant marineand the proposal that we carry our own enormous foreign trade in our own American-built bottoms is a decidedly attractive one-there is only one possible way in which the thing can be done, and that is by Congress granting an annual subsidy which will cover the difference in cost, including both overhead and operating expenses, of running American and competing ships

#### Protection of Our Foreign Patents

HERE are a good many questions arising out of the war's effect upon patents, patents rights and patent business of one sort or another Most of these have not been adequately discussed, and for most of them there appears to be no immediate disposition in official quarters to prepare an answer Not the most prominent, but by no means the least urgent, of these has to do with the filing of applications in one country by citizens of another

The patent privileges granted by any nation to citisens of another jurisdiction are in every case a matter of reciprocity rather than of legal or moral compulsion If American citizens were barred from taking out German patents, we should not be willing to issue American patents to Germans, equally, if we were to refuse to grant patents to Japanese, we could not reasonably complain at retaliatory exclusion of American inventors from protection in Japan. The freedom with which patent rights are granted by all civilized countries to foreign citizens is purely a matter of international ex-pediency and agreement. There is no obligation resting upon any nation to treat American inventors upon most favored ' basis, if we want American inventor so treated, we can only secure that they shall be by extending like treatment

Today, owing to the war, we have a condition where for months or for years it has been impossible for citizens of certain countries to comply with the ordinary legal conditions laid down for the issue of patents in certain other countries A German could not file at all in most of his enemy countries, most enemy citizens could not file at all in Germany, the dictates of military expediency prevented in many instances the regular course of application and publication from being followed, so that it was not possible to file in one s own country without performing some act that would forfeit the right of subsequent application in some other country, and so on

Foreign countries very generally have recognised these conditions and have passed laws relieving inventors of their burdens. In general, these laws have been in the form of extensions on the ordinary statutory time granted to file and prosecute applications, pay fees and taxes, work the patents, etc But naturally enough, in every case the foreign legislating body, appreciating that international patents are purely a matter of mutual consent, has qualified the concession by adding the condition that it shall only be valid in favor of inventors

whose countries have extended substantially equivalent concessions Thus, England will rehew our inventors of the defaults which would ordinarily have been recorded against them, if we will do so much for hers. But if we tell an Englishman that he can't have an America patent because his Government would not permit him to file his application within the time limit called for by our laws, we cannot expect that Britain will show a great deal of consideration for American inventors who have suffered similarly

Now if we ask what our Government has done to make such concessions available for American inventors. the astonishing answer will be -- practically nothing To be sure Congress did pass an act extending the time for foreign applicante, but it expired by limitation is January, 1918, and has not been renewed American and foreign inventors and patent attorneys of highest standing have repeatedly urged action, but Washington is allent American oitizens have benefitted by the extensions granted in other countries, but purely through Patents on which default could have been claimed have been issued in foreign countries to American citizens, under the special extensions granted in those countries, with the expectation that sooner or later we would meet these extensions in our treatment of foreign applications filed here. If we fail permanently to do this-if we fall very soon to do it, in fact-it seems emmently reasonable to suppose that the conditional clause in the foreign extension acts will be invoked, and the rights of American inventors attacked Should this occur, we can for the life of us see no way out for the foreign courts but to declare invalid the patents issued to Americans under the extensions Probably this would awake our legislators to action-or, would it?

#### A "Bluff" Navy

T is perfectly well understood m the balls of Congress and on Newspaper Row that nobody expects Mr Daniels' second 3-year program to be taken seriously-in other words, this stupendous navy of which we have been hearing lately is a "bluff" intended to be used as a club to drive reluctant of heatant nations into line for disarmament

One of the odd elements (we had almost said come elements) in the situation, is that the Democratic party, who have put forward this preposterous proposal, are by tradition, training, conviction, or any other test that may be applied, thoroughly opposed to any such extravagent outlay of the people's money as this phantom navy would necessitate

In all fairness to Mr Daniels it must be admitted that the responsibility for pushing this billion-dollar navy does not lie exclusively on his own shoulders We have noticed of late that he has stated the President is in sympathy with him, and it must be admitted that what looks like very strong endorsement of Mr Daniels has some in the form of a cablegrain to the House Naval Committee from the President, asking for a unanimous vote in favor of the 3-year program

There can be no mustaking the meaning of this cable-The United States is to invite the nations to gram sarm under the shadow of 35,000-ton battleships and the threat of 16-inch guns Why we should rattle the saber at a peace table, where the other delegates are our own Allies, passeth all human understanding

The American people have been getting news of a sort from Paris, but just how far it agrees with the facts, the censor alone can tell So far as the course of events has been disclosed, we maintain that absolutely nothing has transpired to change the naval situation as we defined it several weeks ago Germany, the one naval power that was a threat to the security of the world, has been eliminated, leaving on the high sees only the fleets of nations that are either our friends or actually our allies. In the midst of this amicable situation, we, the United States, professedly the most peaceful nation on earth, suddenly announce that we are going to set out on a cheme of naval expansion, exceeding anything of kind in the history of the world We are told that this navy will be built, if it ever is, as a rebuke to the nations of Europe, should they not obediently abolish, or greatly the flects which they stready possess sidentally it will cost us one billion dollars a year thus to play schoolmaster to Europe and is not this billion-dollar rebuke, delivered shead of the transgression, somewhat premature?

#### ----

The hierris Benching Figure has proved to be a reasonable mether in cone of its recent tests. In a slight from Dayton to Civveland, Pilot Eric Sprunger and Mechanician Ennest Longshamp drave the plane at an averages speed of 172 miles as hour, covering the 215 miles in 1 hour and 15 munutes. The previous record between the two cities was two hours fast. The Martin bomber corrise two Liberty engines. In the fight in question the machine carried gasoline, tools and baggage weeping 2,500 pounds.

Asvenautical Exposition.—Both Madson Square Garden and the Stray-night Regiment Armory, New Yorkcity, will be required to house the big collection of arphanes to be chibited by the Manufactures Arrent's Association at the Aeronautical Exposition late in February and sarly in March. Sections will be devoted to the Army and Navy machines, as well as to British, French, Jalians and German machines The NG-I, which recently carried 50 passengers, as well as the Caproni and Handley-Page machines, will be shown

A New Altitude Record .- Contrary to the belief seently expressed in this column, the altitude record of Captain R W Schroeder recently made at Dayton, Ohio, did not endure for very long All situtude records were again broken on January 2d last, when Captain Lang, R A F, and Lieutenant Blowers, the former acting as pilot, ascended to 30,500 feet in 66 minutes and 15 seconds A two-seater biplane fitted with a British-designed and British-built engine, was employed in making this new record Due to the breaking of his oxygen supply pipe, Lieutenant Blowers collapsed in the course of the upward flight The pilot in front had ne knowledge of the serious condition of his companion, and kept climbing Having reached 30,500 feet, the come stopped through lack of fuel, and the pilot began a long volplane When 10,000 feet altitude was reached. Lieutenant Blowers regained consciousness men suffered severely from frostbite

Airplane Express .- "The important future of airstated Mr Glenn L Martin in a recent talk with press representatives, "is the wonderful commercial application in making accessible by aircraft rich outlying districts tributary to important industrial and business Disastrous delays, such as have been enconters countered on the railroads, will be obviated, and the speed of delivery by airplane is of course apparent Coast patrol, forest patrol, and mail carrying will be extensively developed British Columbia has established a system of serial forest patrol and the United States is arranging a similar system The success of the mail route between New York and Washington is known to The type of machines adapted and developed for commercial uses will undoubtedly be multiple engined, which will make the possibilities of forced landings remote and will permut travel in all Instruments to enable airmen to meet adverse weather conditions need development, and their production is vital to ensure the successful use of the pirolana to commercial uses

Self-Starter of the Liberty Engine .- The Liberty self-starter is an air motor and compressor in one While acting as a starter it runs as a four-cylinder air motor, cranking the airplane engine through a train of gears, inclused within its transmission. At the end of the transmission is a final drive that connects direct to the crankshaft of the engine This drive runs continually at engine speed and operates a small pump which furnishes pressure for the petrol feed. After starting the engine the Liberty starter automatically disengages and remains so until needed for further use, either as a starter or compressor. In order to keep an adequate air supply in the tank the starter is engaged as a compressor by pushing a button on the control valve while the airplane engine is running at low speed. When engaged the engine must be speeded up to 1,200 to 1,400 revolutions eagme must be specied up to 1,500 to 1,500 revolutions per minute At 230 pounds pressure the compressor automatically disengages. The Liberty starter is light, weighing but 30 pounds It is compact, measuring but sight knobes long. It is efficient, caraling the engine at 180 sevolutions per mirute or more and re-plealshing its own energy in 30 seconds. It is simple, as these are no pipes leading to the airplane engine, so on more are no paper reading to the auritance engine, so that it leaves the airplane engine as it should be. The tank weighs 1214 pounds, making the complete outfit 4214 payers.

#### Science

Proposed Flors of the Philippinss—The Philippins Bureau of Science is planning to start the preparation of a new declocary of plant names of the Philippine Islands and a critical enumeration of all known spocess in the islands, with an adjustment of the sponymy, in preparation for the final undertaking a general flors of the Philippines. It may be possible to combine the Filippino names with the systimatic combine that Filippino names with the systimatic combined sill the technical and local names credited to every plant in the Philippines.

Measurements of Gravity The report of the International Geodetic Association re-entity published states that since the last general report on gravity determinations in the Compter radius dt is Vill conference galaxies the neutral oil of the baseouston has received notice of pendulum observations made at about 300 new stations, for 1870 dwth definite radius have been published. The largest number of those discriminations have been made in the Intel States. The total number of stations in the international system of gravity measurements now amounts to 3,200

Testing of Compasses. The last annual report of the Bureau of standards states that little attention has heretofore been paid to the formulation of spredications and the development of methods of testing compasses. The Bureau has recently taken up the matter in co-peration with the Signal Corp is and has drawn up specifications for sirplane compasses and femalic compasses, besidee constructing apparatus for compasse testing Damping liquids for sarplane compasses have been investigated, leading to the adoption of Keron ne unstead of the alcohol and water inviture formerly in use Studies have also been made on the method of heat treatment and agoing of magnets for compass needles and compensations.

Learning Geography with the Fingers—The American Mixem Journal has published on interesting account of the work carried on for the bland by the American Mixem of Natural History in New Jork especially the arrangements whereby bland children are permitted to handle various byets in the ausuring, including models whish out metricition is given concerning those objects. Whin Admiral Paur gave a lecture at the museum for its blant flat relief maps were provided aboving the Art is laded an Austra areas. The auditors were also allow it to handle a number of mounted Sakindo dogs hitched it is abelge. Among the devices for teaching geography are \$5 \text{ rited} filed by a cache 20 insplies in diameter.

A New Process of Coking — the mastery of why rectain kinds of onel pade dock white others do not has never been fully solved. One of the most unportant industrial problems is that of obtaining, toke from the so-called non-recking? coals and it is therefore highly interesting to learn from the list manual report of Bureau of Standards that a new process for accomplishing this disaderatum has been tested by the Bureau, in conjunction with the Bureau of Mines and the Geological Survey, with results supporting in general the claims of the promoters. The details will be awaited with impattence. The new process in tested at Dover Ohio, by a legal comps of Govinnient experie. The test was the most extensive ever inducted on a coke-even process.

Using Piabes to Combat Majaria | he last ant tal report of the Bureau of Fisheries states that the Bur au cooperated with the Public Health Service in the trik of protecting soldiers from malaria in one of the Lu re southern cantonments. All available means were is d to protect and increase the supply of top minnows (Gambusta) in the adjacent waters and circlul olimirvations were made on the effectiveness of these and other fishes in the extermination of mosquito larvae It has been fully demonstrated, says the report that small fishes are in many cases most effective agents for the control of mosquitoes, but their effectiveness depends upon various conditions, such as the presence of debris and of plants of various species wave action, fluctuations of level, etc , and definite knowledge is lacking concerning the part played by these factors Studies on the relation of fish to mosquito larve have been carried on jointly by the Bureau of Fisheries and the Bureau of Entomology for the past two years

#### Engineering

Reising a 24-inch Water Main - A 24-inch castiron water main was recently raised at Boston to a height of seven feet by means of screw tacks. A piece of land had been purchased for a commercial concern from the City of Boston subject to easement for two water It was desired to till the land well above water level, which would bring the grade 11 leet above the top of the pipes As this would make the pipes maccessible, it was necessary to raise them s ven feet above the previous level Piles were driven at each side of the pipes and wire slings placed around the pipes were carried up to serow jacks supported on caps fastened a ross the piles. The water mains were cut at one end but the lifting was done without unsert wing the toints. As the pipe was lifted the joints adjusted themselves to the new almement

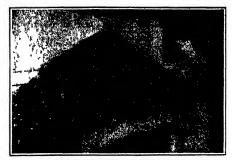
The "Medicinal Taste' of Milwaukee's Water Supply -The City of Milwaukee has been greatly bothered with a peculiar taste in its drinking water This water is obtained from the lake and is chlorinated before distribution. At first it was thought that the chloring produced the taste but a series of tests proved that this was not the source of the contamination seemed to be some connection between the intensity of the taste and the direction of the wind, and finally the source of trouble was located in a couple of plants, one three nules away and the other eight miles away which were producing coal tar products. Quantities of phenol were allowed to escape in the waste and upon test it was shown that this would produce a noticeable taste, even when diluted to one part of phenol in 500 million parts of water The taste was aggravated by the chlorination of the water As yet no method of eliminating the taste has been discovered and efforts are being made to prevent coal distilling plants from throwing their waste into the lake

Creosoting Wood for Buildings -In order to preserve timbers and boards used in industrial building, a system of treating them on the site has been provide In this system pressure is not used to force the creasote into the wood. Open tanks are employed in which a bath of oil is maintained at a temperature between 150 degrees and 200 degrees F 1 he timbers are immersed in oil and and then transferred to a second oil bath in which the temperature is not over 100 degrees I The cooling action of the second bath acts by condensation of the heated air and moisture to assist in causing the atmospheric pressure and capillary attraction to drive the oil into the wood. The periods of immersion in each bath depend upon the thickness and the grain of the wood the time varying from one hour to 15 minutes per inch of thickness A second form of treatment consists in spraying the wood or applying the oil with a brush or The process is particularly valuable in buildings in which a high degree of humidity is maintained roof tunbers of such buildings if untreated are liable to decay in a period of a few years. Freated roof timbers have been found to be in good condition after nine years

Righting a Tilted Intake Crib An interesting bit of engineering work was recently done on an intake crib of the Chicago Water Works In constructing this unb a carson was sunk in the lake and after the casson had been carried down to the proper depth it was found to be slightly out of almement The top was 16 mehes The top was leveled off with concrete and out of level the masonry superstructure was constructed above it It was then found that the cylinder of mesoury was 18 inches out of level and it was necessary to straighten the cylinder The work was done by blasting out a ring of concrete under the masonry and supporting the latter on tacks. Three hundred jacks were used which were operated on one aids to russ the masoury and on the other side to lower it The travel of the tacks varied from zero at the neutral axis to a total of nine inches at right angles to this axis. The work was done under the supervision of an observer who sighted upon 24 targets at 15-degree intervals A corresponding set of targets was marked where they could be observed by the tack foreman and he could check up the figures called by the observer and speed up the macks or slow them down in accordance with instructions. In this way the eyhnder of masonry was rocked back to the vertical



Stocking shell blanks. The resettlement of war workers proceeds side by side with the resettlement of the sojdiers



This girl is inspecting Mills hand grenades In this factory 30,000 of those hand grenades were made by women every wook

# Reconstruction in Europe—III

The British Plan

By C H Claudy, Foreign Correspondent of the SCIENTIFIC AMERICAN in London

THERE has been much publication at the United Matter of stories bringing forth the wonders of the forchandedness of the Bit tith covernment in considering reconstruction problems long before the necessary for reconstruction problems long before the necessary for reconstruction became appare is. But such storus have usually proceeded from written who took into consider atten the British facts and looked upon them as allhout etch saund as American has kervound.

etted against an American has kground.
Had the I nated States continued in the war for a
period of thrit years there is little dubt that we too
would have had foot a Ministry of Reconsideration as
has the British kingire at least a fairly large and very
best hursaw to some dig statement working on the probbest hursaw to some dig statement working on the probmoney of the statement of the content of National
Defons. one eraed only with What shall we do after
the war?

As a matter of fact. Britain with her wholly different and mitch more complicated problem, while she un doubtedly gave, man believed to throm the beginning doubtedly gave, man believed to throm the beginning of the state of th

If it dis some credit must certainly be given the

machinery It is of course impossible to draw its details in a page—scarcely in a book. But its more important shafts flywheels, springs and levers can be indicated.

indicated
The Ministry of Reconstruction is wholly an advisory department of the government with no executive powers—nuch like our own Council of National Defense in that respect. The or creating it define its powers as may arise out of the present war and to institute, and conduct such inquiries prepare such schemes and make with recommendations as the Minister of Reconstruction shall think fit. In addition the Minister of Reconstruction may be given authority to not with any govern

smart mint of the acciton the sommer or reconstruction may be given authority to not with any government authority by order in council of his Majesty to be one of the most vial engines in the British governmental machinery. In getting it in shape to function it has been divided into branches which deal with conmerce and production including the supply of materials, with hinance shuping and public service with labor and industrial organisation with rural development with the machinity of both central and local government including health and education and with housing and internal transport.

The Ministry as a whole and every branch of it is as arranged as immediately to be notified of any proposal looking to the solution of any post-war problem which may be originated in any department of the givernment. If any responsible person or organisation anywhere in the nation has a scheme or an idea regarding any feature of reconstruction the Ministry or some particular branch of it is where he or they go. The Ministry as a whole or

any branch of it may initiate any scheme or idea of reconstruction and if the Minuster thinks well of it, investigate it and make a report upon it. The Minustery in, in effect first a great clearing house of ideas—in a nation as devoted to the purpose of reconstruction in the full meaning of the word is well as to its lesses definitions of restablishment and readjustment, that is prachage its

most important function.
Considering all/reconstruction ideas wherever originating with relation to each other and with special reference to the branch of government which has security power in the particular premises the Ministry builds its reconstruction policy, for submission to the Cabinet and if there approved, to Parliament for any accessary ligations.

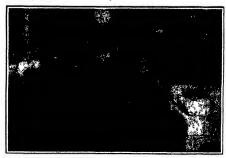
lative actions which may be required.

Obviously this sort of a program is no more a one-man job than a government is a one man job. So the Minuster has created an Advisory Council working in sections four in number devoted to production and commercial organization to finance transport and public services, companies to the services, and the services of the service

It is in this council that the true democracy of the reconstruction program has its origin for each section has representatives of all the principal interests rating with a Thur in the section devoted to finance are not only financers but into runerest—in the section which deals with agriculture are not only agnatultural interests to the tomost interests represented so that no problem as connidered merely from its main but from all its seconomic angine.



Battery of indenting machines for 303 cartridge cases under the watchful eyes
of their women operatives



When the seven million soldiers return to peaceful pursuits, it is proposed to have all the clothing factories running on a peace basis

The work of the council is sharply differentiated from that of the Ministry as a whole The former deals with the specific instance only, the latter with the whole subject The council is well into its labors on many of these specially referred toples, among which are such very diverse, but very important matters as the standardization of rail-way equipment, post—war rationing of industry, organisation of rural information

Metric suppossible here to go unto all the problems which are being considered or which have been considered by the Minustry Some of them will have a very far reaching effect, not only upon the United Kingdom, but upon the United Kingdom, but upon the United Kingdom, but upon the United Ritates Of some of these, at least, it is hoped to treat at greater length later For the present, however, many of these activities must be constituted from one must be constituted from one some the constitution of the

In the branch dealing with is a national probler commerce and production, for instance, the supply and control of raw materials for

for instance, the supply and control of raw maternals for post-war industry is a very vital matter. So us the subpost of financial facility for British commerce and indusry Many industries in English as the missing of financial facility for British commerce and industry Many industries in English as the matter of the provision in a directly interested and is considered by the Ministry of Meconstruction in connection with that department Similarly is the matter of the stablishment of new industries a matter of great moment, and here America may find herealf more than an interested spectator, for the committee appointed to consider this has already made a report showing what new industries can be and what should be established and many of them, especially what should be established and many of them, especially as England, but which we know that consider the has already messes in the United States, affect American expert probabilities in no small degree. Volume of demand of British goods, the nature of that demand, and how best to create a larger amount is getting serious attention, and, to help fill the domand, investigations into improvements in trade organisations to a better and more enonomical production, distribution and marketing, are connomical production, distribution and marketing, are

being conducted in the most practical and go-ahead way Great Britain is not asleep. She recognises that there is to be a tremendous world demand for manufactured goods. The world is in many ways four years behind on

goods The world is in mat normal output, and the devasted regions present a gaping hole which must be filled It is the history of all the second of the second the se

best way to meet it.
Another labor of the
Ministry is in connection
with the disposal of government stores it is comed simple enough to say, "store
them" and it is equally
simple to say, "store
them "and it is equally
simple to say, "store
them is answer at all
fits the emergency Great
Britain was preparing, right
up to the lith of November, for a war of unstated
renight. So was the United



The munition worker (the girl behind the gus) has been a corneratone of the National defense. Now she is a national problem. Reconstruction would be an empty word if the Empire forgot these loyal girls

States. But we had just begun to function and Great Distants' manufacturing machinery, had been speeding up through four years. Her industries were organized entirely on a war beaus onto on a peace bases with war outcroppings! She has immines stupendous amounts of material mad and risk for arrive. To store it is to mulet the taxpair of money both he and the government need for other things. In dump all these stores upon the market may be to runn some modulations and exuse alabor not if in mean proportions industries and exuse alabor not if in mean proportions industries and exuse alabor not if in mean proportions lorries in perfectly good running ordering the proportions of the great motor industry now ready to risums its attaction. What becomes of the men why was of tender to all and blood warnine by the thought of the work-bench the job the wages wating for them promised to them both by their cuplovires and by the government for which they went forth to battle? Yet to store all these where he make the state may be a former to a size all the proportions to above their great and by the government for which they went forth to battle? Yet to store all these where and make the state may be a former to the state of the mean of the proposition is to above their great and the thought into agricultural transport or public service but the question requires considerable thinking out and murch planning—it is one of the practial things for which the Munistry of Reconstruction was created.

tried it is mean proportions literally thouseds of motor new Norwegaan of mew Norwegaan of mew Norwegaan of mew Norwegaan of mew Norwegaan of which many factors and the state of the state



Stripping war armor from the Cathedral of Notre Dame



I here are hundreds of such problems and problems within problems. All are being considered with reference not only to reestablishment pre war conditions but with relation to the betterment of industry commerce manufacturing the individual the labour the municipality the warm the child with reference to the responding of the nation on better, more human mar conomic and more progressive lines. And they are being considered to some effect and with results already apparent because of the Ministry of Reconstruc tion which collects coordi nates and makes practical the combined reconstruction brains of the whole govern ment—indeed, of the whole

#### A Norwegian City Created by the War

As has been the case in most countries the most countries the afforts which industry has begot these loyal girls power in the hundred of Norwayan waterials has power in the hundred of Norwagan waterials has

been of invaluable importance.

One of the man centers of this great industrial revolution is the district around "Sogneljorden," with Julius 100-mile water basin None of the Norwegnan fjords has such enormous water power as this one, and so, has such enormous water power as this one, and so, in recent years one factory after another has been built there. The foremost of these is the enormous plant built by Norsk Aluminum Company, with the Hoyang built by Norsk Aluminum Company, with the Hoyang built by Norsk Aluminum Company, which the Hoyang have Norwegnen industries the plant two years a new Norwegnen industries of the plant with many factories and good and satisfactory deslings for the employees When peace comes this will be an interesting link in the chain of Norray's tourist attractions. When all these plants are running antrapidly they will be Furopes a largest aluminum normally they will be Furopes a largest aluminum normally they will be Furopes a largest aluminum.

#### Restoring the Art Treasures of France

T sas clearly evident at the very outset of the war the harbarran hordes which swept into France, had no the harbarran hordes which swept into France, had no the harbarran hordes which swept into France, had no the harbarran had no the had no t

the nichly (arved entrances of these cidices, the French masked thom with valls of sandbags The work of removing these protecting coverings was started soon after the signing of the armsitice One of the accompanying photographs shows the work of restoring the principal porch of the Cathedral of Notre Damo, in Fans which for years has been hidden behind the second of the cathedral of Notre Damo, in Fans which for years has been hidden behind the second of the cathedral of Notre Damo, in Fans which for years has been hidden behind the second of the cathedral of the property of the p

a mass of certif and sand and Our other histograph is lustrates the disintering of one of Rodus a masterpieces at Dousi. This was discovered by French solders while hunting for hidden mines. It was not bured by the French but by soms German officer who took a fancy to the figure and concealed it with the purpose of disgoing it up and sending it try offered. It offers me office other his of evidence of the systematic despoining and looting of art treasures by German office G

## The Principles of Camouflage—III

#### The Visibility of Airplanes By M. Luckiesh

N the Great War the airplane made its debut in I warfare and in a short time made a wonderful record still when hostilities et med aerial camoullage had not here put on a scientific basis. No nation had developed this general aspect of camouflage systematically or to an extent comparable with the developments on land and an extrat comparation white he developments on long sin-ers. The chief reason was that somutific data which were applied by the reason of the beautific data which quarters there applied to be inwarrent I prejudice, against striving for low visibility of aircraft. But before the close of the war the write completed an extensive investigation of the fundament ils upon which the attainm at of low visitality fr airplane must be based beliations of the publicas encountered in rendering air-planes of low visibility results I and various recommendations were made. The experiences and data will be drawn upon only in a general way but it is hoped that details and interesting byproducts of the investigation can be presented at a lat r date. In this general review such details would consume too much space for the intention has been to present a broad and concise view of the subject of camouflage

The visibility of airplants presents some of the most interesting problems to be found in the development of the sea of the basis for camouflage and many novel and thrilling experiences attended the accumulation of the tarining experience actuated the set diministron of the requisite data. The gueral problem may be subdivided according to the type of airplane its field of operation and its activity for example partel eraft which fly low over our own lines would primarily be cannouflaged for low visibility as vived by senomes above. High flying craft would be rendered of low visibility as viewed primarily by the enemy below Airplant's for night use present other problems and the visibility of seaplanes is a distinct problem owing to the fact that the important hackground is the water because scaplanes are not ordinarily high flying craft in all these considerations it will be noted that the activity of the sirplane is of primary importance because activity of the sipinals is of princed its in rendering the craft of low visibility. This aspect is too complicated to discuss thoroughly in this article.

#### Viewing Aircraft from Above

The same fundamentals of light color and vision apply The same fundamentals of light color and vanon apply in this field as in other fields of samulage but different data are riquird. When viewing aircraft from above, the carth is the background of most importance. Cumulus slouds on sunny days are generally at allitudes of 4,000 to 6,000 feet. Chould are not always present and besids they are of each as with rent order of brightness from that of the earth that it by vanious be considered in camouflage designed for low visibility from above. In other words the compromise in this case is to accept the earth as a background and to work on this basis. We are confronted with scasonal changes of landscape but inasmuch as the summer landscape is of greatest impor-tance generally it must be the dominating factor in dering low visibility from above

On looking down upon the earth one is impressed with the definite types of areas such as cultivated fields, woods barren land and water Different landscapes woons parren land and water Linerant landsrapses contain these areas in various proportions which fact must be considered. Many thousand determinations of reflection factor and approximate color were made for these types of areas and upon the mean values camouflage for low visibility as viewed from above was de-

Wooded areas are the darkest general areas in a landscape and possess a very low reflection factor From above one sees the deep shadows interspersed among the liighlights. These shadows and the trapping of light are largely responsible for the low brightness of on ingine are largerly responsible. This is best illustrated by means of black velvet. If a piece of cardboard is dyed with the same black diet is will diffusely reflect 2 or 3 per cent of the mendent light but the black velvet will reflect no more than 0.5 per cent. The velvet fibers provide many light traps and east many shadows which reduce the relative brightness or reflection factor far below that of the flat cardboard. Cultivated fields on which there are growing crops are nearly twice as bright as wooded are growing crops are nearly (wice as bright as wooded areas, depending of cursu youn the donaceness of the vegetation. Barren sunisked lands are generally the brightest large areas in a landscape, the brightness depending upon the character of the soil, wet soil as darker than dry soil, owing to the fact that the pores are filled with water thus reducing the reflection factor of the small particles of soil. A fix blotting paper which reflects 75 per cent of the incident light will reflect only

bout 55 per cent when wet Inland waters which contain much suspended matt are about as bright as grasing land and ou Shallow water partakes somewhat of the color and brightness of the bad and deep ocean water is about as brightness of the bed and deep ocean water is about as dark as wooded areas. Quiet stagnant pools or small lakes are sometimes erosedizely dark owing to the fast that their brightness as where vertically a simost entirely due to surface reflection. If it is due entirely to reflection at the surface, the brightness will be about 2 per cent of the brightness of the senth sky. That is, when we were sufficient to the brightness of the senth sky. That is, when we were sufficient to be about 2 per cent of the brightness of the senth sky that is a surface of the senth sky that established by actual measurements

#### Earth Patterns

The camouflage which has been applied to airplanes for the purpose of obtaining low visibility as viewed from above has not been founded upon systematic experiments as can be seen by the patterns used. The earth patterns were extensively studied in this investigation and concrete solutions have been recommended. Although it is out of the question to present a detailed discussion of this important phase at this time attention will be called to the manner in which the earth patterns diminish with increasing altitude

For simplicity assume a camera lens to have a focal length, equal to 10 inches, then the length rof the image

HOSTILITIES came to a close before the art of camouflate had been extended to the protection of aircraft, but studies of the problem had been made and these are outlined in the present article by Mr Luckiesh This is the last instalment of the series The first, appearing in the Scientific AMERICAN of January 25, 1919, dealt with the art of concealment and deception as practised on land. and the second, in our issue of February 8, with low sissbility and optical illusion on the sea -EDITOR.

of an object 100 feet long will be related to the altitude h in this manner

$$\frac{x}{10} = \frac{100}{h}$$
, or  $x h = 1000$ 

It is seen that this is the equation of a hyperbola By substituting the values of altitude A in the equation the values of the length z of the image are found. It is easier for some to visualize this relation by means of a change in size of the image with altitude

| Altıtude, h | Size of image, z |
|-------------|------------------|
| 1.000 feet  | 1 00 mehes       |
| 2.000 feet  | 50 mehes         |
| 3 000 feet  | 33 inches        |
| 4.000 feet  | 25 inches 2      |
| 10,000 feet | 10 inches        |
| 20,000 feet | 05 inches        |

It is seen that the image diminishes less rapidly in size It is seen that the image diminutes less rapidly in size at the altitude increases. For example going from 1,000 feet to 2,000 feet the image is reduced to one half. The 20,000 feet the image is reduced to one half. The 20,000 feet by taking a service of photographs and knowing the reduction factor of the less it is a simple matter to study pattern. An amphane of known dimensions can be placed in the imagination at any altitude on a photograph taken as a known situated and the fullify of certain patterns is at once evident

#### Earth Haze and Cloud Haze

It is out of the question to present colored illustrations in this article and values expressed in numbers are meaningless to most parsons so a few general remarks will be made in closing the discussion of low visibility will be made in cioung the discussion of low visibility as viewed from above. A black craft is of much lower visibility than a white one White should never be used. The paints should be very dark shades. The hues are approximately the same for the earth areas as seen from the earth's surface. Inland waters are a dury blue-green or bluish green, and deep ocean water is a

geenish blue when viewed vertisally or neastly se. Before considering other aspects of camouffage it is well to consider some other factures such as has, circulas and sky. There appear to be two kinds of hase which the writer has arbitrarily called sorth hase and diptud hase, respectively. The former consists chiefly of such and dirt and sorois and untually extends to an altitude of about one mile although occasionally it extends much higher. Its upper limit is very distinct as seen by the higher. He supper limit is very distinct as seen oy use "false between This horizon is used more when flying high than the true horizon. Out of the top of this hase cumulus clouds are commonly seen to be poking out like nearly submerged tockers. The "cloud" hase appears somewhat whiter in color and appears to extend some-

nearly submerged sobergr The "doud" hase appears one services where the color and appears to strend sometimes to allutudes of several or even many miles. The services of the color of the

#### Airplance Viewed from B.

Doubtless it has been commonly noted that airplanes are generally very dark objects as viewed from below against the sky Even when painted white they are much darker than the sky As they ascend the sky above them becomes darker although to the observer on the ground the sky remains constant in brightness. However, in ascending the sirplane is leaving below it more and more luminous have which acts as a veil in ading to sersen it, until when it reaches a high slutude the combination of dark sky behind it and luminous hase between it and the observer on the ground renders it or low vanishity Another factor which contributes somewhat is the diminishing size as viewed from a fixed position at the earth. The minimum perceptible contrast becomes larger as the size of the contrasting patch di-

minushes
Insemuch as there is not enough light reflected up-Inasmuch as there is not enough ight reflected up-ward from the earth to illuminate the lower ends of an opaque surface sufficiently to make its brightness com-parable with the brightness of the sky it is necessary, in order to attain low visubility for airplanes as viewed from below, to supply some additional illumination Com-putations have shown that artificial lighting is imprestroable, but measurements on airplane fabrics indicate icable, but messurements on arplane fabrics indicate has on easy, days a sufficient brightness can be obtained from direct smilight diffused by the fabric to increase the brightness of the day. On overcast days an arplane will indicate the days of the day. On overcast days an arplane will dissipply sliminated. That so, the brightness of the sky. However, low validity and not obtained on sunny days which is an advantage over high validity at all times as a the case with sipfaness ow in use Many observations and computations of these and other factors have been made so that it is possible to compute advantages, but also disafrantages.

Having considered low visibility of already as viewed and workers. Having considered low visibility or already as viewed and workers. Having considered low visibility of already as viewed.

advantages, but also disadvantages.

Having considered low visibility of aircoaft as viswed from above and from below, respectively, it is of interest to discoust brefit the possibility of attaining these with a given airplaine. Frankly it is not practicable to do this an airplaine to be of low visibility against the earth background must be painted or dynd very dark shades of appropraise color and pattern. This readers it almost opaque and it will be a very dark object when viswed against the sky. If the lower surfaces of the sirplane bell oversides a fact object against the sky and a very dark object against the sky and a very dark object against an overseas sky, except at high a situation of the sirplane still residuals as dark object against the sky and a very dark object against the sky are as a already explained. The only practicable method of (Constants or page 44):

(Continued on page (61)

#### The German Art of Make Believe

#### How Germany Got Along With Various Substitutes During Her Prolonged Isolation

PRIOR to the war by far the greater portion of raw attiffs required by Germany were imported from abroad (in reund figures valued at about 10,000,000,000 marks) The blookade practically shut down foreign imports It is thus natural that the question of sub-stitute materials became the absorbing one in Germany Officeal, indistrial, and scientific Germany applied its utmost energy in attempting to solve it. The question was not only to take care of the pressing war requirements but also the difficulties that might arise if the country had

out also the dimentices that might arise it the country had to become permanently commercily independent. The principal efforts were made in the fiber and thread industry. The most interesting inventions in the field of textile substitutes are those procured from burning metéles, and it is believed that a most valuable suband it is believed that a most valuation suc-stitute for cotton has been found A company was founded to investigate and encourage the use and produc-tion of nettile fiber As the demand and production in-creased, this company was soon obliged to absorb the

earlier and smaller concern devoted to the work Instand of the former process of steeping, an engineer invanted a new channes process for the extraction of the giutinous matter of the plant fibre, which, according to the opinion of experts, as of the highest value. In the cultivation of burring netting rose tropgress has lickwise been made. The present company is planting great quantities of nettles on previously untilled issued, expe-entally low lands, and forming regular plantations. Thus the basin of the former Taitower Hea is now being planted with nettless and seconding to the most favorable methods with nettless and seconding to the most favorable methods and Notices are historical and the very native. earlier and smaller concern devoted to this work Nettles are likewise being planted as if they were in their wild or natural state, and in the shade as well as in the sun, experiment having shown that the plants thrived in

They are further being planted in alder woods and in regular farm fields, the latter having previously been believed secutifically impossible. Thousands of serve have been cultivated in the Friesack, Stottin, and Celle districts. The nettle needs but httle care and fertitizing,

but water at least 18 meters (about 50 fect) below the surface. Specialists place particular importance upon the fact that their cultivation really improves the soil. The nettles are also percunnis and the same field can be cultivated with them for five years running.

Spinning of nettle fibr has been known for years.

The old Egyptians were familiar with it and the Garmans have long known it. In modern times however it did nave long known. In mouren times however it did not seem practical, owing to the difficulty encountered in separating the fiber from the stems. The chemical separation of the fiber from the stems. The chemical separation of the fiber from the stems and the whole thing both possible and important to large scale produc-

While nettle fiber has proved a valuable substitute for While nettle moer mas proved a valuatie sunstant; for cotton, so has the stem of rushes (Typha) proved to contain valuable substitutes for himp and jute. Up to now no practical use has been found for typha—it has merely been considered a uscless wild growing pond merely been contained by the Cerman press typhs has now been found to be of the greatest white and service and the contained by the contained to the present

Peat fiber belongs to the most interesting discoveries in the field of substitute textile raw stuffs. This immot in the field of substitute texture the stiffs in its innor, however be preciseally used with at maxture with other kinds of fiber. A mixture of 40 per cent peat fiber and 50 per cent wood gives at or ling to the opinion of German experts, a very storing and dumble material that looks extremely well and is excilent for means dotting looks extremely well and is veiled if it must stolling in the valuable qualities of p it is his r he were are insisted by the difficulties in proturing the pat. Only the younger moss turf called frantial criminus some eight per cent of the curls whith an its employed manying moss black peat (and for luming) can not be employed. The production from about 5,000,000. double hundredweight of peat amounts to about 100,000 double hundredweight of fiber in other words, a very small amount when the later and the actual yield ar both taken into account

The textile industry has also done its best in order to find a substitute for the leather which is required in constantly increasing degree. A German textile com-pany has succeeded in finding a prifect substitute for appears which will also a times of poace prove most

Not only in the textile industry but also in other fields German ingenuity has been liusily occupied in its at-tempt to find substitutes. Special interest was thus directed toward the production of artificial rubber, s question which has been technically solved in times of peace Artificial rubbir was produced prior to the war, but was shortly given up owing to the fact that cultivated rubber fell in price from 30 to four marks per kilo (2 2 tounds) When the scarcity of rubber again arose with the war, the production of synthetic rubber was again considered Substitutes however had to be discovered owing to the lack of raw stuffs accton and aluminum When it was found possible to produce aceton from roal and carbide and to produce aluminum on a large scale, the production of artificial rubber could be undertaken But the synthetic rubber is evidently merely fitted to a war need, for it can not compete with the genuine article Added to this its cost is much higher than London quotations for genum rubber

I ndless energy was also expended in the field of food stuffs. The question of employing lupine as a foodstuff on a large scale was studied. A large company with a capital of 3,000,000 marks was founded for this purpose m Chemnits

The food values contained in lupine, however, o prove serviceable when the bitter mid, which makes the lupme fruit entirely unpalatable, has been removed The flour which is produced tastes good, is very nutritious (Continued on page 182)

#### Correspondence

The editors are not responsible for statements made in the correspondence column Assertment communications cannot be considered, but the names of cor-respondents will be withheld when so desired

#### The Associated Mountaineering Clubs

To the Editor of the SCIENTIFIC AMERICAN In 1916, nine clubs and societies with comm associated themselves in a Bureau, with headquarters in New York The membership now numbers 22, comprising over 20,000 individual members, as follows

American Alpine Club, Philadelphia and New York American Game Protective Association, New York. American Museum of Natural History, New York Adirondack Camp and Trail Club, Lake Placid, N. Y. Appalachian Mountain Club, Boston and New York ne and Crockett Club, New York British Columbia Mountaineering Club, Vancouver Colorado Mountain Club, Denver

Frean Air Ciub, New York Geographics Society of Chicago Geographical Society of Philadelphia Grean Mountain Club, Rutland, Vt Hawaiian Trail and Mountain Club, Honolulu Kiahhane Club, Port Angelos, Wash

Field and Forest Club, Boston Fresh Air Club, New York

Masamas, Portland, Ore Mountaineers, Seattle and Tacoma

Mountainers, Bestle and Tacoma National Association of Audubon Societies, New York National Park Service, Washington New York Code, Colleges Booleys, New York Ork Prairie Club, Chicago Rocky Mountain Olembers Club, Houlder, Colo Sagebreuth and Pine Club, Teklinzs, Wesh Sterne Citch, San Frencisco and Los Angeles

meeric Giri, can Francisco and Los Angues
The burses publishes an annua builtin gwing the
officers, mescabership, dues, publications, hantern sinds
obsidetions, outlands, and other matters of interest of each
with and sectory. Among their measuren mans, and
with and sectory Among their measuren mans, and
with a sector of the companying of membran regions
and the around of landing peaks, are colpression with the
National Tank fewrice in membrang protecting and developing max National Farks and floramentary, and in
protecting the mass and florems with bird and annual life in

their natural angreement. Many of the clube and societies usue illustrated publications on mountaincering, exploration, and conservation and at educating their members by lectures and courseons to a deeper appreciation of nature

Acquaintance with the literature f a subject is essential to efficient work in the held at I the bureau sends many important new books on mount incoring and outmany important new books on mount incring and outdoor life to its members. All  $x_i \in \mathbb{N}$  thus, it is mountaineeing hierature has been gather in the curtail building
of the New York Public I labour and the American
Alpine Club has deposited it: \(\frac{1}{2}\) is therein providing
a permanent fund for addition. \(\frac{1}{2}\) it is therein providing
or permanent fund for addition. \(\frac{1}{2}\) it is therein providing
collection has been published it in this interval and a collection of photographs of mountain secure vs. but ing formed
to supplement the literature of a region with it is count
to supplement \(\frac{1}{2}\) it it is first in \(\frac{1}{2}\) conditions.

#### A Better Guide for the Blind Pedestrian

476 kifth Avenue New York

To the Editor of the SCIENTIFIC ANIRH AN
I have in mind a device which I believe to be new for
the aid of the blind in walking.

My idea is to place on the end of a light walking stick a small whoel say two inches in denietr with solid rubber tire. The wheel is to be proved so as to turn in any direction, like the roller on a talk kg. This came would be six or eight mehos longer than the ordinary came, so that the wheel would run a few feet alread of

came, so that the wheel would run a fix feet alread of the man and each sat feeler approximation for each but p, step or unevenness in time, to allow for it. I believe one would become see justiced in the use of that that he would earned by least in stipping of an ordinary surp. If anyone will try to wall blandfolded, over a short proof of wilk in which there are a few small over a short proof of wilk in which there are a few small as wheelbarrow, he will, I thank find a great difference Of course that is crude, but in the absence of such a device it is perhaps the best and, to approach the subject device it is perhaps the best way to approach the subject

It may be that a metal tire would give better results than a rubber one. The cane should by all means be adjustable in length so as to suit the user The wheel and all metal parts should be light and strong, probably

and an motal parts drough he light and strong, probably of aluminum

I have no thought of taking a patent on this, but simply believe it will benefit those blinded in the war, and select your columns as the best medium of publicity for such a Buggestion

PVT ALEXANDER McMILLIN Co C, 11th Machine Gun Pattalion

#### Wireless Control in a New Dress

To the Lditor of the SCIENTIFIC AMERICAN Your editors in a recent issue on the subject of radio monopoly covered the ground thoroughly, and I am sure was greatly appreciated by the large number of your readers who are interested in radio. That per-necuous bull was defacted and for a turn, all seemed well for the free development of the art

On the 23d inst, however I noted an Associated Press dispatch in the Washington Stir to the effect that an 'Interallied Communications Conference' was to meet in l'ans on January 25th and among other subjects was to arrange for the control of radio after the war lu consideration of the idea of control expressed by

our naval authorities at the recent hearings before the Committee on Merchant Marine and Fisheries, one cannot help but wonder if there is not some plan on foot to obtain by means of an international agreement the monopoly that was denial by Congress

I respectfully submit that our internal afferra such a operation of small radio stations should not be governed by laws made abroad in this manner

Would it be too much to ask of the SCIPATIFIC AMERICAN to look into this matter, and again sound the

IOUN & Princers

#### Farming Implements

To the I ditor of the SCIENTIFIC AMERICAN In these times when so much inventive and manu facturing enterprise is given to plowing maclouds and tractors. I have been surprised that some one does not go one step farther back and nevert a digging machine to be operated by the weight of the engine, as a man uses his weight to operate a spad or digging fork. Such a machine for small holdings would have immense advantages over any kind of plow or tractor and could vantages over any kind of pious or tractor and course work areas even as small as non sere to any depth required and the weight of the engine would be an advantage and their would be no tendency to ship past the work to be done. Digging was the earliest and best the work to be done Digging was the carliest and best method of cultivation and plowing is only a poor substitute, invented to save manual labor. Why should we not go back to the best system now that we possess that power that is adaptable? Bullocks and horses the first tractors of course, could not dig, hence the invention

of plows

Murrulen Wingen N & W

## The World's Coal Supply

Where It Comes From and How It Is Used

THE fundamental basis of civilization is fuel and the I one universal fucl is sal. We burn wood and oil and gas when we can or when we have to but we always recognize that these finds are more or less substitutes for the standard fuel the fuel upon which the industrial fabric really depends coal Accordingly figures bearing upon the supply and production and consumption of coal are always in order and always interesting I rom a variety of sources to numerous to estably there have recently come to our attention a quantity. I statistics of this sort and we present their herewith in painless form for public consumption

form for public consumption.

In the first place, we are tild that of all grades of coal ranking with or ab \( \) bitumin as the visible supply is \( \) at \( \) bitumin as the visible supply is \( \) that in the knows and \( \) (000 feet in depth—extraines which in the knows and \( \) (000 feet in depth—extraines which under present methods are not usually within the possibilities of commercial use but which will doubtless be made available by the time they are needed. This

figure is imposing a nough but it does not transcen i the human imagination by quite so much as it would have four years ago when we were still counting in militaus rather than in the bil Loans have since made us accustomed. Indeed, from billions to trillions constitutes a leap exactly as long as the one which in passing from millions to billions In addition to this

vast hoard of combusts bles which Nature has laid away for us there may he some three tril lion tons of sub-bitugrades which does not, for the present, get in-ventoried with the other and which we may accordingly ignore heresome parts of the world do very nicely with coal that is mostly lignite, and that everybody may and that everybody may have to come to it some day. Of the 4 ½ trillion tons that qualifies as regular coal the United states is credited with nearly half - two trillion comes China, with a trillion tons German with 400 billions Canada with 250 bil lions Great Britain with 200 billions Russia and Austria with 50 billions each The countries cach The countries comprising the rest of the world are individ-ually nowhere though them they

muster the very pretty total of 550 billion tons should descend to counting cost in incre millions of tons we should find France and Belgium leading the pack of

CAPACITY UP TO INCOME PROPERTY OF

CONLINE OVER ME GOO ALL OWATES

Annual production naturally does not in every case follow the resources in a gantule. Of course the United States leads here again with 513 million lons for 1913— States page art significant of the past four twelvemouth born and is still hearing far more than its fair share of the bust full presents of the bust four twelvemouths born and is still hearing far more than its fair share of the burth of statistical service. But China and Canada standing well up in resources have developed these resources to such a small extent that the former is included under the general licating. Asia which is credited with 47 million tons, while our northern neighbor suffers the even greater indignity of being lumped with "All Other ( quatrics ) in the production of 57 million tons Germany and Great Britain, ranking fourth and fifth in the count of resources, are practically taid for second place in production, with 275 and 290

milion tons respectively. Then come the former Dual Monarcht, with 54 milion tons and Russus with 32 milion tons while France and Belgnum, not specifically mentioned under the head of resources here enter to the amount of 40 and 22 million tons, in order Of course, it is a reckless assumption that production in this ratio will continue anofamicly. The very fact that some nations will approach before others the extension of the continue on the contribution of the fuel needs of the world, today consists in showing how long their several deposits would last, at the current rate of deploting the openist would last, at the current rate of deposits of the contribution of the fuel needs of the world, today consists in showing how long their several deposits would last, at the current rate of deploting the contribution of the contribution of the fuel needs of the world, today consists mishowing how long their several deposits would last, at the current rate of deploting the contribution of the contribution of the fuel needs of the world, today consists in showing how long their several deposits would last, at the current rate of deploting the contribution of the contribution of the fuel needs of the world. posits would last, at the current rate of depletion

posits would last, at the current rate of depistion Making the calculation we find that the United States is using put coal at a rate of which would lead to exhaustion in 4,000 years (rend Britain in 550 years Germany in 1,500 years Russian in 1900 years, Austria-Hungary in 1,000 years Belgium in 350 years

but merely to her financial inability to burn it at the price which she would have to pay for getting it from any cristing center of mining operations. Taking these and all related factors into consideration, one authority has suggested that the world's coal may reasonably, be expected to hold out, under present methods of distribution and use for shout 1 500 years

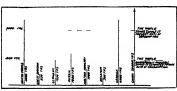
tion and use, for about 1,500 years Some idea of just what these methods are may be got by glancing at a series of figures that have been compiled showing what was done with a normal year's production of coal in the United States and in Germany The comparison is not a stretly accurate one, since in the United States as good deal of coal that is actually earnemed in the heating of dwelling planes gets charged to the production of power Under all other bands the compilations appear to follow closely the same lines in the two countries, however, and may be taken as a reasonably lar presentation of the manner in which the use of coal varies between nations on the two sides of the big pond

It is not necessary to in-corporate the figures into our text, since they are to be found at the proper points in the diagrams herewith It will be herowith It will be noted that we have made the comparison a fair one by ignoring actual tonnages and confining ourselves to the percentages of the national production used for coal production used for each purpose Any one who will, can convert them into actual tonnage by using the total production figures already

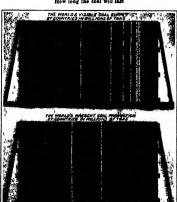
On the whole, the On the whole, the divergences between American and German practice are not extraordinary. The sum total of coal consumed for power production, before and after coking, is reasonably close in the two cases, though Germany makes a far better showing with regard to the amount coked before using. This, of course. using This, of course, gives her a real superiority, since the elements driven off in the coking, and recovered when that is carried on under modern methods, are of

modern methods, are of value and represent clear profit Perhaps her ad-vantage in the figures here may be taken as fair measure of the de-gree to which Germany has besten us in the in-stallation of by-product coke ovens to replace the old and wasteful bee-huge time. hive type Domestic use shows remarkable correspond-ence in the two coun-This must not be taken too seriously, h

in view of the inaccuracy of this item in the American figures Certainly the impression prevails that we use

figure . Certainly the impression provals that we use a lot more onli in heating our house hother and longer than seems necessary to the European It is to be expected that of the onal produced and used in a compact area like Germany, less will be required for realized due than as the case in a large territorial until like the United States . For example, if all the coal mined in the like the country left to its own resources for fuel, no cost would have to be used up in carrying Pennsylvania was 18 tone per capita each year, while California, with the water power and it at oll fields and its great distances from coal deposits, gets along with but 18 ton. Never-compact of the control of the country left to the sure. Pennsylvania court of the compact of the country left to the sure presents and the control of the country left to the sure. Pennsylvania uses 18 tone per capita each year, while California, with the water power and it at oll fields and its great distances from coal deposits, gets along with but 18 ton. Never-country and the country left to 


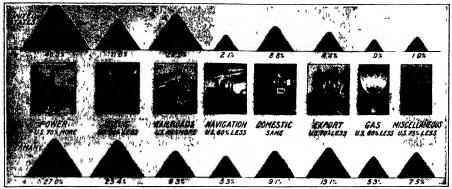
How long the coal will last



How the rate of coal consumption drops as the size of the power plant increases; and the division among the countries of the world's visible supply and annual production of coal

while if we assume that the total production in the groups containing China and Canada, respectively, is practically all attributable to these centers, we can estimate that the Canadian fields would hold out for 4,000 years and the Canadian fields would hold out for 4,000 years and the Chinese for five times as long. For the world as a unit the figure is 3,400 years but this of course would be greatly reduced if the imperfectly explored Chinese fields should turn out to be a disappointment, either in accessibility or in workshiftsy or in quality

As a matter of fact, however a moment's reflection will make obvious that the world has not a coal supply will make obvious that the world has not a coal supply for the next 3,400 years in supil. In the first place, we may reasonably look forward to a fairly constant in-crease in population, with consequent increase in con-sumption. And in the second place, it seems certain that as the Chinese fields two opened, the docamade of China, now almost negligible, will be greatly expanded. The case can hardly be otherwise, for China's small soal consumption is due to no unwillingness to burn this fusi,



su in the center e ma ere I tw If he we coke \*0 per cent less of our nat than the many does of horse t pper and lower facures represent per cotages of annual produ How Germany and the United States compare in the uses to which they put their coal

railroads is coal I von so, the discrepancy between our showing and Germany s is considerably lessened when we recognise the great role which internal navigation plays in the continental system of distribution and lump the items of coal for railroads and coal for navigation Internal navigation is the factor of importance here because the vessel that coals in Germany for a voyage here evens the matter up by coaling here for the return

interesting, even though of no practical conseque are the calculations of a British contemporary who has looked into the question of the air necessary to burn up the coal that we use in a year. The accepted standard is 15 pounds of air for the combustion of one pound of coal On this basis, and taking the world's consumption of coal to be 1,400 million tons per annum the total amount of air needed in the combustion of this tonnage would be 21 billion tons, or 617 million million cubic feet This amount of air would fill a cube of 16 miles or a aphere of 20 miles diameter Roughly it represents one 240,000th part of the weight of our atmosphere of it after we have no more coal to burn When we talk about ultimate exhaustion of our coal

When we talk about ultimate exhaustion of our coal we pare the way for discussion of means toward conservation. When we consider that the cheap coal always gets taken out first leaving the innecessible venus for a later generation we must realise that coal will never get cheaper than it is, and will in all human probability continue to get more costly. Here is another and, it must be confidenced a far more immediate sput to continue. in the use of coal What are we going to do about it?

One thing that we are going to do about it sooner or

later, is to burn the coal in great central stations at or near the mines In other words, instead of transporting near the mines — in other words, instead of transporting the fuel to the user, we shall transport the power over long-distance transmission lines — Development of such lines and of the central power station itself are sufficient problems to absolve our engineers of any charge of neglect in that they have failed sooner to bring these conceptions into effect. When they do come into effect, however, it will be found that elimination of the burning of coal to transport coal is by no means the only saring produced Canadian Government engineers, after a most paintaking survey of the field, have estimated the rate of consumption of coal in electric generating stations of various size, using coal-fired boilers. In a station of

ered solvers. In a station of capacity under 1,000 kilo-watts, the very best that can be hoped for is the generation of one horse-nower ner vacbe hoped for is the generation of one horse-power per year for each 26 i tons of ond bursed. In stations running from 1,000 to 5,000 kilowatte capestry, the coal consumption should average it tons per horse-power per year. When the squarty is increased than the renge 5,000-1,000 the benefits is small, its coal that was per horse-power per year is selection; and the coal that th capacity falls between 10 000 and 50 000 kilowatts however the coal consumption fails to 9 32 times for stations of capacity 50,000-100 000 kilowatts it is 6 57 tons while in stations whose capacity exceeds 100 000 kilowatts, it has been found possible to furnish one horse-power for one year by burning only 6.25 tons of

coal It must be remembered that the very advantageous hure has to do with plants in who is ill outditions are favorable in particular where the pash load is very moderate and where the minimum 21 hur 52 week demand for juece as substantial on. N. plant can create a record for low cost unit wif runs substantially all the time at an approximat on It fill cupretty. But when it does so run, results are little short of amazing to the plants studied by these novelta, after him with the plants studied by these novelta, after harm 21 tons of coal per annual horse-power in stating generating current for sale, and 23 tons is industrial power plants serving single factories.

#### Passing a 50-foot Ship Through a 44-foot Canal

THE floating of lake steamers through the Wellani Canal by outting them in two so that the locks will accommodate them, and then requiring the halves for ocean use is by now an old story but it has recently cropped up again with a hrand new angle. The latest ship to be floated through the canal in halves was not smp to be neared varying the range in active was in-merely too long to be accommodate in the beks hit it was too wide to go through the canal at all yet it made the trip successfully The snewer to this seeming paradox as shown in our

The answer to this seaming paradox as shown in our correct of this vecic, was the tiles of 1 A lusts of the United States Shaping Board Lake the answers to enany knotty problems it was simple cough once Mr Eustis had pointed out how it was to be done. The shap, a 10,000-ton freighter of 460 feet length and 50 feet beam, was bisected in the ordinary fashion then such half was gently but none the less firmly rolled over on its beam ends to be towed through the Canal which has a width of 44 feet only Leven so it was a tight squeeze—so tight that the engineers in charge did not eligible to the control of the control o

side with a clearance of cight niches on each side between her decks or the keel and the side of the big ditch

As may be imagined the task of rolling a 10 000-ton vess I on her add is no early one. No attempt was made to do it by means of cranes or any such direct incohanical means. A series of big tasks was secured to what was means A wree of big tanks was secured to what was intended to become the unite raile of each hall of the ship and these were pumped full of water. The calcu-lations were will made and the capacity of the tanks proved just sufficient to capacia the sections which rolled gently over on their sides just five hours after the pumps were started. After the passage the sections were rolled back by attaching similar tanks to appro-priate points along the expise liked

One interesting feature is found in the fact that none of the machinery or heavier fittings were removed for the rolling and floating Accordingly the refitting of Van Hase for service after she got through the canal will be a simple matter. We say will be because while the passage of the Canal was made late in the fall, it was not plauned to bring the two sections to their destination and fit them together until the coming of spring One section of a freighter had already been lost in Lake Ontario last year and the engineers were in clined to await a season when they would be taking no chances with the weather It may be said that the joinings of ship sections brought through the Welland passage is effected at Montreal whence the restored passage is elected at monthless whence the research wessel proceeds under hir own power so the necessity for taking into account the critchets of the weather man in towing sections through Lake Ontario is apparent

#### Chloroform Application by Tube

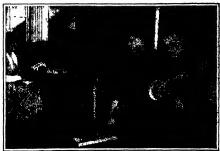
A NEW method of administering chloroform has been brought out in France by Dr Guiser He no longer applies it by the usual compress or mash placed over the mouth, but introduces the chloroform vapor directly mouth, but introduces the chlorotorm vapor unready into the lungs through a tube running into the windpipe. The tube mothod has already been employed in several lundred cases and with great success. Besides being hundred cases and with great success. Besides being very useful for operations to be performed on the head and neck, it is of great interest because it never produces the names which is almost always the result of ap-plications of chloroform in the ordinary fashion and phoances or entertorm in the ordinary lashion and thus the patient is releved of cause of suffering.

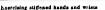
The effects of the new method will serve to explain the reason why chloroform applica-

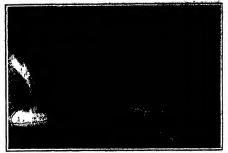
tions always produced nat when operating by the for-mer method for it appears evident that the name caused by a part of the chlorocaused by a part of the chloro-form vapors being absorbed by the esophagus and the stomach Of course this is not necessary, for the whole of the vapors should go to the lungs, and this result is now reached by the new method It therefore marks quite a progress in the right



Plosting the bew section of the "Van Hise" on its side through Welland Canal







Machine for exercising the fingers and wrist

### **Human Reconstruction**

#### How the War's Shattered Victims Are Reeducated for Civilian Life

NOT the least important part of any reconstruction Note that important part of any reconstruction program is the rest ring of the manned and crippled soldiers to a failure site, is failure site, of industrial usefulness. The European beligerents have long been faced with that problem and ever sin of the manned and eriplied first began to flow back from the harthefedden. of the war those countries have maintained hospitals of the tare and schools for their resduration. And now the United States is brought face to face with the same problem which it has tackled with the same acu men as the other problems of modern warfare

The first duty of a nation toward its maime crippled solds raise to restore them to as near their former physical condition and usefulness as possible. Thus the soldser pats at its cared for until his strugth is regained. If he has lost a limb an artificial one is provided after careful study and fitting to make certain that it comes as near replacing the lost limb as is mechanically Then the patient is resolvented first in the us of the limb and then in h w to use it in a more or less prolonged course of occupational therapy. In instances where woulds have cause I stiffness or loss of dexterity a treatment is given followed by a course of exerc tending to restore much of the original agility and dexterity of the muscl s and bon s

How tiffened muscles an l bones are again restored to their customary or near customary state may learned from the accompanying illustrations which depict several in handal devices which are typical of this imply throughout this country. In this case the devices are in use at the Chine for Functional Reedication of Disabled S ldiers and Sulois and many

of the patents are our cripped dier ne of Chite su Thierry fame with the Marines well represented The men are here supplied with artificial limbs and it the completion of the training I cd ral agents will assast them in obtaining

positi us One of the devices shown serves to exercise the ankl and lower all It will b noted that the foot which is atta hed to a turn talle lifts a pound weight as it is turned from sile to sil An in lieat it moving over i scale next to the turn table indicates the effort ex p. nded

A similar device is em ployed for strengthening the weakened wrist. The hand is strapped to a turi table and when moved from side to side serves to raise a two-pound weight in direct proportion to the power expended A dial serves to indicate the effort,

so that the strength of the weakened wrist can be con-

so that the strength of the weakened write can be con-stantly measured.

For curning flat feet and stiff legs the devices employed are of the simplest. In the former case the patient walks on two boards slanting away from each other, as shown in the latter case the patient walks with one foot on a steadily rising platform and with the other on a horirontal platform thus causing the first leg to be bent more and more

Ankles may be strengthened by using another device shown which causes the ankle to be worked from side shown which causes the ankle to be worked from side to side A smaller machine whentphens the fingers and wrist. If the patient is unable to turn the wheel which operate this device a nurse does it for him. In the remaining picture of this interesting collection are depicted everal patients exercing their stiffseed hands. The first man to the right is operating a dial arrangement of the control that the control of the control of the control of the control of the chimates any possibility of deceiving the doctor. The second mean is controlled to the control of the control cummares any possibility of acceiving the doctor. The second man is operating a whicel arrangement for strengthening his fingers. The third and fourth men are undergoing finger treatment by means of weight-raising devices. As the fingers are raised and lowered, weights which are connected through pulley arrangements to the gloves the patients are wearing, are moved

Aside from these exercises which tend to restore the Annue from these exercises which tend to restore the patient to a relative state of usefulness from the physical standpoint the Government also provides a course in occupational therapy. This latter course has amply prived its worth wherever it has been scentifically

provided, and increasing importance is being attached to it by physicians in military and other hospitals as home and abroad. It is now universally recognised that occupational work for the convalescents must be suited to the patients condition and graduated to develop normal functional activities and ultimately normal vocational interests and expansities. Such occupational work provides an essential and ecistation means of insuring hypoxid, meantly and ecistation means of insuring hypoxid, meantly and expensive the provides an essential and ecistation means of insuring hypoxid, meantly and complete the provided of the patients of the vocational training school or directly into practical vocational training school or directly into practical vocational tenspie of the patients of the vocational training school or directly into practical vocational training school or directly into practical vocational training school or directly into practical vocational training achool or directly into practical voc

patient's mind on one mistoriume and to keep sum from worrying constantly over his physical handicap. Again, in some instances it is aimed to remind a patient of his condition in order that he will do everything in his power to overcome his disadvantage. It makes him follow the doctor's instructions. So it is evident that occupa-tional therapy has a psychological application as well as

tional therapy has a psychological application as west as appending one.

Take the wearing of baskets, for example, as an agent of functional restoration. The size, shape and weight of the basket determine whether the movements involve wrats, elbows, or shoulders large code and simple weaving require strength and broad movements, rather hand the statement of the strength and broad movements, rather shape with the statement of t

than skill and coordination Raffia and an intricate pattern or stitch involve pattern or stitch involve delicacy and accuracy Fragors which cannot close about a reed of ordinary diameter can firmly grasp one of large diameter. As the fingers are thus un-consciously exercised the range of movement in-creases, and the flagers may progressively hold reads of small diameter Rope or twine in place of reads will sometimes relieve annicular neion and give pliability

to the fingers Whether the patient is ous of work being definitely prescribed to aid his condition or whether he m thinking of occupation as a privilege not interfer with his recovery, the termining of occupe must always be a mest serious sonsultation teresen the doctor re teresen the patient



Device for exercising stiffened foot



Machine for strangthening the sakle

position. Whether the pertient known there is a prescription or not is a matter of psychology, but is a sivaye necessary that there be a prescription, and the results of occupational president should be charted

Casadian Squres, which construct the Casadian Squres, which can be controlled by those of other countries, show that SQ per set of the disabled in the hospitals are able to return to their former competitions, and that of the remaining the complete of the complete of the competition of the competi

the case of patients with "Messiase for uses require so "seducational training Although these patients need no training to become supplyable their need of occupation must not be munimated from the standpoint of morale, therapeute requirements, and cultivation of habits of work. Such patients constitute that the standpoint of morale of the standpoint of

supervised shop
But for those who will have no such trianing the only
opportunity for adjustment to work will be in hospital
occupations. Thus, begun in the ward occupations and
completed in the curative workshop there must be some
repearation for the demands of rivinian amplicyment
of habitory of work must be learned military
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The great sales of ward computents from the relution of the sales are the sales are the sales are the temperature of the computents and provided and bent being uncovered by ward computations. This is not strangs when it is known that the majority of meneter upon life occupations as a most baphasard way and that few have had the opportunity either in their limited schooling or in their industrial experience of discovering their natural interests and aptitudes furthermore, the immited data which the vocational officer

can seeire during the preiminary interview on which to base a vocational scheme and the doctor's uncertain prognosis for the patient at this time, prevent a scientific and completely outlined course of vocational training

There can be no doubt of it that ward occupations give an opportunity for occupations that ward occupations give an opportunity for occupations that was not a large measure determine his future by the times the officer is able to make a defiante statement reparding has future physical condition, and the vocational conditions are proper training course, the patient will have found his own interests, and under careful guidance have formed has own deares and obvice for training. Thus, as the currently guidance have formed and the condition of the version of the vession of

In more, the precent rection of their branches contributed in a most dispositive photos of the





Machine for strengthening the wrist forcest ( strength at mer Curing flat feet and stiff legs

broader field of peace day recenstration. It is a vast undertaking especially with our this vand the anemy who have suffered to a far given by the transport of the recens on a consoling thought that with proportial variety of the account of the peace o

#### Taste as a Chemical Reaction

THE sensation of tasts while of numon and come want experience in highly my let I in its nature. What is commonly called tasts or an its simple sensation of the sense of tasts the tension of the sense of tasts the tongue recits is impressed of various other sorts all of which go to make up the complex A finally recorded in the cone is saness that to do in which go to make up the complex with a mild amount of pain certaints with astringency or acridity—which are in them lets further complexes of thermic and tastile sensations and doffee are cantriely different from their true wives when served at mappropriate temperatures and it is a matter of record that a person of lik it creat view make the most fuderous errors if ask. I blindfolded and with his nose stopped to defently sill-knowed placed.

Stripped of all externals and camouflage however there remains the unques tioned residuum in the transmitt dfrom the mouth which past be recognized as the true sense of tasts It is a t nearly so diverse in its range as one might infer from the valiety of foods which have their listinctive flavors in fact the psychologists agree that there are but four distinct taste sensations— those characterized asswert litter acid and salty. Conthat the nose really does listinguish as many dis tinct odors as there are elects t be smelled and that by virtue of its timate commetion with the offut ryorgan the sense of tasti boriows a good many of the But the simple

fundamental fact is that these four are all the tastes there are and that all flavors are could instions of these and of the artransport mentions already mentioned of course

are and that all flavors are c indinations of these and of the extraneous smeatines after dw minimin of of course-lasts, in obviously a chained phenomenon for it increases only in the rase of substitution which can be dissipated in the fluids of the mouth. The person who give a chain of lead in his mouth may relied at the statement that since it is insolitable in this sadvary liquid be didn't taste anything but it is a fact that the disagreeable sensations which he experienced were wholly those touch and as had to the processor as of the statement of the man and had to the processor as of the statement of the s

#### Airplanes by the Hundreds

IN America aviation figures have expanded beyond all expectations Ouly bark in 11th when our punitive expection went into Mexico we had less than a doner machines available and less the nu week later this seemal force of it can be termed as as it was reduced to next to nothing

this acrial force is to come to rectain the first of the next to next to nothing.

At a recent celebration in San Diego (a) a fleet of 212 (urtiss 1 N type training planes fire for two hours over the rectain 1 N to house a cover the rectain 1 N type training planes fire to the rectain 1 N type training planes fire the rectain 1 N type training 1 N type training planes fire the rectain 1 N type training 
overthectly. The planes came from Rockwill In the nearby and were manned by students training for service in the Army. Yafar as is known, the accompanying photograph do puting most of these machines in the air shows more airplanes in light than any published thus far

#### Humpback Salmon on the Coast of Maine

THE Bureau of Lisheries continues its effort to acpink salmon on the coast of Maint and is biginning to get sucouraging results xtensivi planting of finger lings from a shipment of 1 000,000 eggs from Puget Sound was made last Spring in Dennys and Pembroke Rivers The Bureau reports backs entered rivers in eastern Maine in August Sep-tember and October, 1917 and specimens have been taken weighing 1012 pounds It it stated that the hump back in its new environment retains its lacific habit of proceeding to the ocian shortly after it begins to swim and returning to the rivers to spawn and die at two years



Two hundred and (weive American training pleases flying over San Diego, Cal.

### World Markets for American Manufactures

Edited by LYNN W MEEKINS

A department devoted to the extension of American trade in foreign lands

#### The Game Is On

AFIFR four years of intensive triming in export trade the United States is ready to incert the chall lenges which its allies in war u.d. impetitors in peace are histening to declare. Until the t rins of peace are settled there will be more er less uncertainty and lack of confidence owing to the h k fad finite foreign trade policy and until such a p h v is formulated there will be a great deal of criticism of the Government in commercial circles Lately Gr ! Britain has announced the replacing on its list of it substited imports of several commedities that did a t require becauses for a while American instufacturers iffected are complaining bitterly the sands of dollars worth of orders being held up and they want to know what our Government is going to de about it. In the rebuilding of the north of France and Belgium at is becoming evident that our nerchants will not realize the titanic fortunes that many have anti ipated that I rance is able to take care of a fair part of its needs and that Creat Britain Switzer-land and Germany will contribute their share the lastnamed in the form of indemnity Toward the end of Ameri an held to ourselves the cotton goods market in Argentina slumping badly because heavy consign ments arrived from several producing countries In the Far I set of course we have had strengous competition for some time

less than a year ago a British engineering firm sent to a prominent American manufacturer an order for steel shects and plates writing that lowing to war conditions, we are willing to waive the usual terms of payment we are withing to whive the usual terms of payment against documents at Liverty ool and we have a confirmed credit with our bankers in New York against which you may draw upon shipment of the material I pon receiving a reply to the effect that the American com pany required each with order our friends across the sea hastened to voice their disappentment. You blawsted hastened to voice their duapir intment. You blawsted
Yankees may hold us up now they raved but wait
until this blooming war is over. The di mands of the
firm in the United States, however, were based upon good and sufficient reasons. To manufacture those sleets and plates a priority order had to be obtained to trans port them to the scaboard a railway shipping permit was needed to send them out of the United States an was needed to send their due of the clinical states an export hiense had to be accured. If the order happened to be annelled before, the shipment reached New York the manufacturer would be involved in serious difficulties. And hi was not compelled to run that risk because he had enough business to keep his mills running 24 hours a day

#### Trade Handicaps in Wartime

There have been many instances of the failure of foreign importers to understand that American exporters have been encompassed by a veritable maze of regula-tions and restrictions and numerous complaints have arison reflecting unjustly up nour commercial practices.

A man in B icnos Aires pr tested that he had paid in advance for a consignment of jewelry Six months elapsed and shipment halyet t be made The explanelapsic and shipment haryet to made. The explan-ation was simple no resent could earry it the few steamers on the River litte run leng needed for es-sential cargoes. There were numerous cases too in which an order with or without a remitance came from abroad to an American firm that was unable to acknowl edge its recept it auss of jostal and cable censorship and invarially the fireign system endemned that firm often other American bisness men as well Nothing is more injurious to trade than delay Mar

kets rise and fall conditions change buyer and seller drift apart so it is our misfortune that aithough the United States has been the principal source of supply, and in most part the only source of the wild s needs in manufactured hors it has not been easy to purchase from us Now that the clouds are I livning over it be hooves us to remove all these difficulties and to make it decidedly worth while for our Furopean and Assatic and South American cousins to patronize our well stocked store We shouldn't go to the extreme of ramming erchandise down their throats or to the extreme of sitting back and doing nothing but the thing to do is to send salesmen to describe the advantages of our products and to back them up with real service

#### Making Better Products at Lower Cost

The mechanical ingenuity of American manufacturers is an advantage that weighs heavily in our favor. Up to

1914 a New York Importer brought in large quantities of theap cuttery from Germany Most of this con-suited of pocket knives that could be imported at a much lower cost than the prevailing price of American-made knives of the same grade When the German supply was cut off the importer bought a small plant in New England and began to experiment with the result that, despite the very high cost of steel he succeeded in turning out a better product which he could sell at a lower price than he had received for the German knife before the war Another example is even more striking Until recently the United States has not been an exporter of earthenware. An Ohic manufacturer skill-fully adapted hard-baked porcelain to large scale pro-duction and managed to land his goods in South America. more cheaply than the German manufacturer used to deliver them from Hamburg

The British have been successful in foreign trade The British have been successful in foreign trade largely because of their patience remarked an American just back from England They say that we are to anyou to make a quock turnover and dunchmed to the up our capital. This is advanced as a serious obstacle to the carabalhament of the galakth industry in the United States. That product, as incombustible substitute for ivery and celluloid come from summed milk and the thecker also require many months in which to have a recovery the summer of the summer harden properly It was made originally in Germany, now Ingland is manufacturing it on a commercial scale Attempts to produce galaith in this country have failed because the necessary capital was not forthcoming. The American export commission house thrives because so many of our manufacturers want to convert their goods into cash as soon as possilic and do not care to wait until their products reach the foreign merchants to whom the shipments are consigned

to whom the shipments are consigned. The feeling in American manufacturing circles that the Covernment is not adequatily supporting our area of the covernment is not adequately supporting our results of the consideration. There are, inclusive of meeting the moves of our competitors—by relaination and by bargaining. We have the nicessary machinery in the War I rade Board the Shipping Board the Federal Reserve Board and the Department of Commerce: The effectiveness of these agencies has shready here demonstrated by the control of the control strated When the British began to cut ocean freight rates the Shipping Board did likewise meeting cach reduction promptly In the War Irade Board we have an instrument for combatting unfair restrictions of imports and exports by other nations the Federal rve Board is having something to say about the exchange situation | Finally the Department of Com-merce is sending to all parts of the world as trade com missioners trained business men to seek new markets for the products of American factories. Such representatives in the past have diverted millions of dollars worth of orders to the United States

#### American Shoes Favored in Italy

seems strangely appropriate that the country shaped I assems strangely appropriate unat the country summers like a boot in a growing market for the American shoe manufacturer and just as Italy a toe dipped into the Stratt of Messina, is rounded, so do the Italiana his position comfortable footwar and shun freak fashions. Mena shows and laborate and shape and laborate and the stratter of the stratter comtortable footwear and snun ireax issued in order and latest and women s lines of typical American shapes and latest conservative styles are sold to the exclusion of shoes built on an exaggrated swing last or with an extremely

Before the war great quantities of shoes were supplied to Italy by Germany, and at a recent meeting of repre-sentatives of American factories the question was raised whether German firms had much chance of regaining their former hold 'From our experience I don't thin

their former hold. From our experience I don't think they have for a while sayway said one of those present. The manager of our branch in Milan is an American citizen but he name is German. Shortly after Italy entered the war an angry mob set out to destroy every-thing in the city connocted with or suggesting the Tea-tons. Our man had to invoke the said of the American consult in city of the American consult in city of the American

tons our man had to invoke the aut of the American consul in order to save our property.

Milan occupies the same place in reference to business in Italy that New York holds in the castern part of the United States It is the banking, credit and merchanin Italy that New York holds in the eastern part of the United States It as the banking, credit and merchan-dising center. To comprete permapently in the Hailan market, American manufacturers should have agincies there Italian testes abould be studied, full lines of samples above, sufficient stock carried, delivery guar-anteed within a reasonable period, and, above all, liberal credit granted to established and reliable irras

#### Greater Comfort Afforded by Our Facts

Greater Comfort Afforded by Our Feetweer

'As to the comparative ment of the American and the
Fnglish shoes sold in Italy, said a man familiar with
the trade, our footwers up of more attractive design
and affords greater confort, while the British product is
provided with better sole leather and stands longer
wear, making if more salidatedry Nevertheless,
American shoes are in strong demand owing to their
supernorty of workmandup, finish and style.' The
popular better and the stands of the supernorty of the supernorth of the sup

know that few bootblacks outside of the larger dites are provided with yellow point.

During the period of the war the United States furshabed to Italy from four to five times the value of our normal share of imports owing to our ability to supply goods in larger quantities than other sources. In connection with plane to keep a fair part of the Italian above business it is interesting to note the methods employed business the interesting to note the methods employed business the interesting to note the methods employed business the interesting to note the methods employed to be former in desling direct with retailing a supply of the former in desling direct with retailing and a saving of middleness profits to the consumer and in a wide distribution throughout the kingdom. English makers are particular to meet Italian tastes in shares. an a wide distribution throughout the kingdom. English makers are particular to meet Italian tastes in shapes, siyles and weights. The Germans used to send traveling asslemm on requisit trips to open credits and collect bills due. Advertising matter in Italian quoting prices in Italian currency delivered in the town was employed for trade development. C o d packages were accepted by the German postoline suthentities.

The large numbers of Italians now returning home from the United States will augment the demand for American goods in Italy and at the same time improve standards of living They will make fun of their country-men who go barefooted and the latter will purchase shoes in order to be as well-dressed as they are Although there is a growing shoe manufacturing industry in Italy, supplied mainly with American machinery, that country will be a large importer of footwear for many years

#### Honduras Needs American Agencies

If the United States is to retain anything like its present share of the trade of Honduras said a recent valid for the guidapla several general morthandsamp houses under strictly American imagement should be ordalished without dolay. The country is about as large in area as Cuba and although the population is probably not over 600 000 the market is worthy of doser probably not over 600 000 the market is worthy of doser attention than American exporters have given it Amapala the only Pacific port of Honduras which sup-plies all the territory between the borders of Salvador and Nicaragus, as well as the capital, Tegucigalpa, there is no place to buy hardware, farm machinery, motors is no place to buy hardware, farm machinery, motors gasoline sagness and other general lines. This business was formerly dominated by four powerful German inport and export bouses which maintained numerous branches. Unless American segrecies are placed in Annapais to handle imported American merchandies, for which there is a ready market, this lucrative trade must resum eventually to German hands.

return eventually to uerman nands
"Gradually the Hondurans are adopting foreign
manners and customs in living and dress but there are
few American stores, beds, bathtubs and other house-hold goods in use Many articles that Americans con-sider necessities are not soid yet the fact that nearly every
handle home has a serving machine and many breast sidor necessation are not sold yet the fact that nearly severy humble home has a sewing machine and many houst a phonograph indicates that the people are becoming more progressive. Typewriters and coak registers are quite common, and wherever roads exist the automobile has been introduced. There as a demand for American footwear, high-heeled and ornamental shoes being preferred, and for rubbons, embriedieres and leave. By keeping up the present standard in quality, granting liberal credit and exactly to combring a with readeins memory and exactly interpretable and exactly the readeins memory and the reader of the reade and carefully complying with packing requirements, American firms may hold Honduran bunness, but they must be more adequately repre

#### Treatment of Infantile Beriberi

Treatment of animature Eventuer of some years by the Philippine Bursus for use in the treatment of infantile berbers More than 460 likers were prepared ast year, and distributed mainly through the Liga Nacional Plupus, park la Protection de la Private Infantile stributed mainly through the Liga Nacional Plupus, park la Protection of the Private Infantile Theorem and the Liga Nacional Plupus park la Protection of the Private Infantile Theorem and Theorem an

#### Making Two Destroyers Into One

THE destroyer "Nubian ' of the British navy while THE destroyer "Nuosan of the smissa navy wante in partic, ran into a mine (probably when the stern was swinging over as the boat was turning) and the after-half of her was blown to pieces Fortunately the attended her builkheads was good and tough and the riveting well done, with the result that the forward half of the vessel remained affoat and was ultimately towed to a dockyard

Another victim of the war was the destroyer, ' Zulu Another vacuum of the war was the destroyer, 'Zulu which touched off a mune that tore the forward third of the vessel spart and left it looking like the proverbial "pile of sorsp iron. In this case also the bulkheade beld and the salvaging vessels were able to tow the

after-part of the "Zulu" to the same dockyards in which the 'Nubian' had found refuge

It is one of the fortunate circumstances attending the wrecking of ships by mines that the action of the high explosives is so swift, that it blows in the portion of the ously affecting the resi of the vessel, that is to say, a of the vessel, that is to say, a vessel may lose bow or stern in fact may have it cut absolutely away and still remain water-tight through out the rest of her structure This is what happened in the case of the two stricken destroyers, and all that was necessary was to cut away the wreckage, float the two destroyers (or what was left of them) into the same dry-dock, line them up to a common longitudinal axis pump out the dock and proceed to fill up the gap between the boats with the necessary scantlings, plating etc Fortunately, they were sister boats of the F Class the Nubian being built by Phornecraft and the Zulu by Hawthorne Fach is of 1,000 tons displacement and

38 knots speed
In christening the nautical
liamese twins that had been thus produced, the Admir combined the names of the original two vessels call ing the new ship Zubian

#### The Mystery of the Boomerang By P. A Valle

THE boomerang is the of an airplane volplaning to carth

Everyone has seen the con jurer flipping his cards out over the audience so that they return to him The reason for their coming back reason for their coming back in, in the first place that they are spinning. Every spin ing thing trees very hard to stay in the plane of its rotation. That is why the top stands up and goes to sleep. That is the secret of the gyroscope, the scientific toy we all admire

The cards obey the same law

If they had no spin

The cards obey the same law I they had no spin they would fall as strught as they could to the floor, slipping in the art first one way, then the other, even as a convenient in swell of the card must obey the law of avaritation, but it is so light, and there is so much fraction of the lower side, that it has no choose other than only he card must obey the law of gravitation, but it is so light, and there is so much fraction of the lower side, that it has no choose other than only he card must be considered by some steps had of ice. It is resting on a medium to deman for is to peakerste in anything approximating a Thak, height; is the extipaciation of why the boomerang counts fastly, The implement, we can cause so, consists

of a piece of bent wood quite flat on one side and raised or curved laterally on the other. It is grasped firmly at one extremity and thrown away spinning so rapidly that it is practically reduced to a circular plate of wood of

diameter equal to the straight his poining the two ends. If we were to reduce the wind in the boomerang to a circular plaque of the same diameter, this would evidently be very thin We should have then in effect a circular wooden card but it would be so light in proportion to its superficial area that it would be practically worthless for throwing In the boomcrang n the other hand we have the concentrated weight for throwing yet we get the effect of the plaque or curl hin the rapid spin

restricted fall. In the one case the plane is a fixed and permanent apparatus with a definite area of sustaining irface in the other the boomerang presents a movable and varying quantity which by its speed of rotars motion makes up for its la k if superficial area and for the local mobility i its a istaining surface

So much for how the immerrang mess back I have said nothing of how it go s away it may seem rather like putting the eart befor the hise i d al with these two aspects in this order but it fit is the great myst ry of the boomering has always been its return flight Its outward journy alvers seemed natural enough even to these who hil not un kestand it for it

went the way of all things thrown away from the threwer there are how ever several phases of this mtwar i flight that are quite ntcresting

I have referred to the I somerang on its return as in example of an airplant volplaning to earth Ou ite nitward journey if is a good simple of a plane climbing but in this case the engine that is the power of the

A consideration of this leads one to inquire whether it would not be perfectly teasible to build an airplane on the principle of the boom rang This would mean a flat plane or wing revolving on a vertical axis in a nearly horizontal plane. This ma approximately as the boom rang and having its virtical shaft fixed to the plane as nearly as possible at the caset center of rotation would if driven by a suit able engine fly and rise as surely as does the boom rang. It would be merely i questin of alculating the occessory superficial area of the plane and the deficience from this figure which would be permusuble on account of the retation

I have said that the plane might be flat but it would probably be found dearable to have the outside edges or the ends of the boomerange hane so curve i that in som ning at a high tate of speed th y would produce the effect f a shallow disc as in the latter as most people know is an inverted saucer and i is an inverted source and a very good airplane on who has long as the spin lasts and the power of the trap that eje ts it is felt arries its own gyroscopic stablizer. It would seen that this curved end to the boomeras g plane would tend to preserve the normal ass plane lines and so to produce the vacuum upon which we are assured so much of the otheren y of a plane depends Not the least puzzling part boomerang is the manner in

which its plane of rotation to approximately horizontal Pages of Luchid and of algebra have been offered in elu ilstion of this point pages which I find much less convincing than the very

pages which I mid from ress continuing that the very simple dea which I propose now to advance. The pull of the right hand and arm in throwing the boomerang is invariably inward. That naturally lays

boomerang is invariative invarid a nationally lays the plane of spin of the boomerang a little outward.

Everybody has seen how the boy s peg top hes over at an angle until it finds its most constant axis—the at an anguluturi it must its most constant axis—invertical one—when it goes to sleep. It is in my opinion,
somewhat the same with the boomerang in the sir as
with the top on the floor. When the boomerang goes (Continued on page 188)



Salving in the bows of the Nubian' after being mined



Stern of the Zulu being towed home after the bow had been blown off



The two portions put tegether making a new destroyer under the name "Zublan"

effects the distribution the world over the arcle
The boomerang, therefore comes sming back to the
person who threw it; excell, as an araphase volplanes
back to the earth. But to get the idea clearly we must
magne the arrplane, instead of the ordinary wings to
have one or more large flat arms so placed that they
consider a manuscription arms section of the ordinary. represent a comparatively narrow section of the original plane, and revolving at a high speed. If this idea is

carried out, we have a perfect analogy to the return flight of the boamerang The phenomenon contists simply in the return of an object to earth in obedience to the law of gravitation, through a medium thick enough to prevent its un-

# Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

#### Device for Transporting Kegs

Will N a heavy keg is to be moved the usual way is to dump it end over end or roll it a system which often causes a lot of dringe to the kegs and their contents besides being hard in the back of the man whese job it is to move them about the envey there ilhandles the heavy legs it as a vinioner saving time and lift r. The investoria saving time and like. The inveverse shoved up close a gament that then of the INVESTER 18 keg and n wirel cj attach dit the device is thrown over the keg. He handle of the conveyor is then be night backward with a siddly missement which lifts the keg from the floor The loop of course, is essential in keeping the load from

I has simple device has proven of great value where rapid transfer of kegs is desirable. It is fair to assume that the desirable saving of time and later together with the added economy resulting from clim-mation of damage should pay for the installation of the conveyor

Improved Method in Photomicrography

FROM a British source comes the following in teresting and valuable suggestion as to an improvement taking photomerographs of steel that is photographs of the magnified area of the crystalline structure of iron

In the ordinary vertical camera in which the plate supported at a distance of 10 inches or more above the microscope the length of the

focusing screen is often the source of much memory nence a further difficulty which is suspended in order to chiminate vibration arises from the oscillation which almost mevitably occurs when the dark slide is It was suggested that to meet these diffi ultres a means might be found of reflecting the beam herizont illy and so adjusting the focus without the use of a our d glass in the usual position. The telescopi arrangement here described was designed for this purpose and refocusing cunera. A similar device has been adopted in the Le Chutcher injero scope and camera but in spite of its generally known in this country

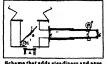
I be construction of the apparatus which might be attached to the front f my camera is shown in the illustration where the broken lines incheste the path of a learn which converges to form a point in the image. Rays proceeding from the interoscope eyepice A which would normally converge to a focus on the photographic plate are reflected borrontally by the inovable mirror B this mirror is attached to a metal plate large enough to cut off all light from the camera when in the position shown and camera when in the pesition shown and as prevented from p wang beyond the 45-degree position by an adjustable stop attached to the signale. He deflected beam is focused by the tels scope objective E (focal length, four meles) upon the cross-rines F, and the image so formed as even, together with the cross-wires, when examined through the sys-lam C (focal length, 3/ useh). The magnification thus obtained is about the same as that

given by the use of a hand focusing k na upon (or without)

will be seen that to cach length of camera there corresponds a fixed nt I to which the cross-wires must be set by pushing in the dring tube and

the up ing tube and closing the claimp H. It is convenient to graduate the shding tube by direct comparison with the ground-glass, in numbers representing the corresponding camera-lengths When this graduation has once been made, it is sufficient, in taking a photograph, to fix the tolescope for the proper camera-length and focus the microscope so that the image is clearly defined on the cross-

wires Ar soon as the focus is ascertained factory, to be steady and satus-



Scheme that adds steadiness and ease of focusing to photomicrography

which is a common plane galvanometer mirror though the best result would no doubt be given by a silvered right-angled prism I or ordine purposes the sample form described has proved sufficient and represents a consider able saving of expense in comparison with the more correct construction

lens, and no doubt the full field could thus be obtained, at

the same time it would certainly be well to make the ob-

ective achromatic

found to arme from the use of the mirror,

### Electrically Heated Food Truck LOSPITAL trucks which are elec-

I trically heated are proving a great comfort to the patients of the Massa-chusetts General Hospital enabling them

Electrically heated feed truck for hespital service

the dark slide having been opened before focusing the exposure can be made by simply turning back the milled head ( so that the mirror moves into the

Wheeling kegs instead of rolling them

types and have proved quite satisfactory in working, the field is, however, rather narrow about one-third of the diameter photographed being visible at once It managested that the eyepiece of the telescope might be provided with a field-

vertical position The lenses described are of the simplest

to be served with hot food. So often to be served with not lood so office where the kitchen is at a distance from the rooms the food gets cold before the trav comes to the patient This electrically heated truck has done away with that decomiort

The truck measures 61 mehes long 30 inches wide and 63 inches high and con-tains 15 travs It is built of Russia Iron with galvanized iron inside lining, and it is insulated with asbestos. The truck is mounted on broad rubber-tired wheels



ere concern begins and ends. From the rage recovered from the mile beausant reach railroad there is extracted gains for the ears, its addition to other flows.

which makes it easy to push from reom to room without the slightest nose. It is heated by the ping and over consection made on each floor where the truck stands a few minutes waiting for the attendant to deliver the trays to the

The use of this truck will bring supp-fort to the stok people who find it bard to relish the half-cold food that is often

#### Eliminating a Railroad Waste

"HF war has developed in a singular way the ingenuity of the technologists away the ingenuity of the technologues of all nations, who have been called upon to repince, by equivalents that can be obtained, materials which have become scarce or altogether unprocurable By wittue of the constantly tightening Allied blockade, the German industries re the first to tread this path, and the Hun chemists have developed many an 'ersats," from war broads and aqueous solutions of dextrine for use as table oils, to elastic bandages without

a trace of rubber But little by little, France and Eng-land and the United States have had their attention drawn to the better utilisetion of manufacturing, agri-cultural and mining residues which heretofore, through ignorance or negligence, have en allowed to go to waste. And now that peace has re-turned, the question of economy remains a live one to every member of the business and industrial community Utilisation to the spirit of

the times, and in this spirit M Alexander Grison, shief enganeer of rolling stock on the Para-Orieans Railway,

has just worked out an original method of treating the rags recovered from the of treating the rags recovered from the surb-boxes of his cars. These cars are equipped with boxes in which peoples greaning ascended by means of a packing of wooden waste in direct contact with the axid-trees. Every three or four mouths the ears go to the maintenance shops, primarily for time repairs; and at each viait the rags are removed from the axid-boxes and replaced by new Pre-viously the old rags had been discarded sitogether, with a naturall aloss of the textile strell, as well as of the oils and greases that if carried. present that it carried

present that it carried.
It is the loss that M Orseon has exceeded in eliminating. The technical details of his process need not be discussed here, since they comprise little mere than an uninteresting section of bodings and dryrups and flierings and dryrups and flierings and discussion in an intermination element of the section of the section of this, after by me approach the sections this, after by me approach the section of this, after by me approach the sections this, after by me approach the section of this, after by me approach the section of this, after by me approach the section of the secti dition that they may go back

axis-boxes instead of into the ter.

The shop in which all this is is a small one, costing but a few if rance for installation, and requirements on the constant of the same to operate it. After a sary observes.



"Take Up" instead of "Wear Out" Suppose that valves couldn't be ground when they got leaky Suppose there wasn t any spring to piston rings

> Suppose bolts couldn't be tight ened up after they worked loose

Trucks tractors and motor cars would be mighty short lived if it wasn t for take up here and at other points where wear goes on Rattles and pounds would soon develop to tear them to pieces

In the bearings which always have to stand a lot of hard knocks and important The take up feature of the Timken Roller Bearing enables you to make a brand new bearing of it at the end of every season All that s needed is a part turn of the adjusting nut or removal of a shim

Another important thing that Timken Taper does for the tractor, truck or passenger car in wheels, differential and other points of service is to take end thrust just as well as downward load

Because of Timken Taper Tim ken steel and workmanship Timken Bearings not only resist wear them selves but they protect and extend the life of other important working parts of the machine Learn more How Can I Tell?



GARMENT B I LAVION 16 Green 9t.
New York N Y Thi invention rilates to garmenta known as bloomers and has particular
reference to the string of it same. An object

Electrical Devices

ELECTRIC ALLY CONTROLLED rmbodies a bit into r I than operation valves controls I to a misk and I tak device dives by the ingine which make and break take can be manually regulated for variable spend rotation or automatically regulated for custant appeal retains.

C instant spool reaction

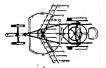
FIRCIRIC MOTOR H W JEANNIN 300

Porter Ave. Warren Ohlo. The object of the Porter Ave Warrin Ohlo The object of the invention is to privide an arrange ment of plates whereby the usual slicility frame is illuminated and the end plates a commercied directly with the field. Another object is it if it slid is did of imminated materials with journed sect inse which a case measure for connecting the field with the end. place of the ma hinc. A still further object is to provide an arms use with it is formed from lami may having depressed growers similar to the field for holding the parts in proper ulinement

FIRCTRIC SEI ECTIVE DEVICE -A H lates more particularly to a mile tive calling device lates more particularly to be set of calling device of the kind comprising a librality of electro-magnitically contribed switching device sot to be operated in succession when a predetermined skinal is received thereby causing the slarm or other electric if rult to be completed only upon the reception of such signal

#### Of Interest to Cuttoners

CHITIVATOR A I BAKER Horman Cal The invention has for its object to provide a device adapted for all classes of work wherein a supporting frame carries the cultivating mechan ism which is adjustable with respect to the frame



A TOP PLAN VIEW PURK LITIVATOR

both vertically and angularly the mechanism being sectional and capallie of independent adjust-ment and whorein unans is brooted for guiding the frame to permit the ground to be cultivated close to a tree without the ne mads for the draft animals to pass becount the branches.

HI GAR CANF PLANTER -W G STEPHEN son Ogdensburg N Y This invention relates generally to the planting of sugar cane the prime object being the provision of means to facilitate this operation through the pay of a machine in this operation through the use of a makine in which the operator may be transposted along the rows or lines of planting with mesus to carry the seel care an I fed the same continuously with the assistance of the operator to the previously propared ground

viously propara d around

COW Pb.A. Halk's STFR! A F REFERENCE

102 1 % N W Washington D C Link

102 1 % N W Washington D C Link

invention relates to hervestirs of that type

attachable to mowing machines and more

particularly to one will it drives its power from

that developed by the test in wheels of the

machine ow shift it is atta bed The prime

object to powel a setupite mechan by which

object to powel a setupite mechan by which

opportate Annier object is to provide a fleshing

machine attachable to the knift iner of a suower

of such a nature that the knift of arm by praised. of such a nature that the knife bar may be raised and lowered when desired with but little effort

HEADING KNIFE FOR MILO AND THE HEADING ENIFE FOR MILD AND FHE LIKE — B. Davip address O B the hardson Room 3940 Knoz Building shan Jose Cal The invention relates to heading knires adapted to be applied to the right or left hand and particularly intended for use in harvesting milo Mafir corn Expysian corn and the like The invention

RECENTLY PATENTED INVENTIONS relates to kniver or the type including a finance partial finance of the type including a finance blade and a coarding relatively fixed cutter of the band at the paint. An object of the band at the paint is to provide an arrangement of airspa for societies the hand piece to the hand

seference. It the string of it same in a place is a provide homeomer state in an even in agram in a provide homeomer state in an even in agram in a provide homeomer state in an even in agram in a state in a principal constructed to have a providence of a skirt in a tention below to be provided a derawaterian with a has an classific section of a first in a place of the invention is to provide a provide a derawaterian with a has an classific section of a strict of the derivation by which a cheachy constitution in the strock high of which is failured in a strict of a strict of a strict of the strock high of which is failured in the strick high of the strock high of which is a failured in the strick high of the strock high of the strick high of the strick high of the strock high of the strock high of the strick high of the



SHOWING THE TARTH IN POSITION WHEN DESIGN CORD HAS BEEN PULLED

The invention is characterized by the provision of an operating mechanism with an ordinary injet valve casting an inrush of water when the layer is operated and the siphoning and emptying of the tank and the automatic reconnecting of the flost to shut off the valve when the tank is again filled

to anut on the valve wins the table is again taken

ACK HIGHER II T POPTES. Locandedburg Oblo The fixvention is of scored use as a

sack holder for holding the east, while being falled
but is more particularly, intended for use on the

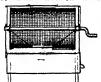
grain spouts of inreshing machines. An object
is to provide means that will readily adjust itself
to various thicknesses of sack material and

means take will not send to pen under the load. as the sake is filled

Cliair — il Maries care of North River Hotel Barcley & West St. New York N. Y. The invention has for an object the provision of an arrangement of springs for acting in the double an arrangement capacity of custing and olevating means for assisting in causing a person to rice from the chair. Another object is to provide a chair with a swinging seal action with springs for holding one end of the isottom or seal clevated and means for limiting the olevating action.

THERMOSTATIC TRAP—R N TRAYS La Cross Wis The object of this investiga is to provide a construction whereby a thermostatic member is used for giving back and forth movemember is used for giving back and forth nove-ment to a valve member in order to open and close the same under varying conditions. Another object is to provide a trap with a vaive member operated by a thermo-member held in place by an athurable support. A further object is to pre-tend the provide a trap with a vaive member to provide the provided by the provided by the tong throat by reason of its spiral shape.

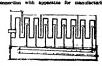
ASH SIFTER -- I Ross: 401 F 100th St ANH HIFLER—I HOSE 401 F 100th 8t New York N Y The invention relates parties tarly to a dustless salt after among the objects is to facilitate the emptying of the recovered coal and coarser material. The after comprises a rotary drum constructed from open mesh mater



A VERTICAL SECTION OF THE SHIPPER

ial means are provided for rotating the drum, and a draw is provided for receiving the sches the coal or large particles receiving in the drim may be delivered to a receiptacle, brough an opening provided in the drum the degrics is en-

ODNDENSES—M T BROWN and G, W SOUTHERLAND care of George W Southerland Naval Stores Equipment Co Box 92 New Orleans La This condenser relates more particularly to condensers adapted for use in



A VERTICAL LONGITUDINAL AWOTION

turpentine the of the objects is the provision of a condenser which receives the super from the still condenses it and the discharges it therefrom Another object is to provide means for retarding the passage of the vapor therethrough whereby the vapor may be completely condensed

the vapor may be completeny conductated BOTTLE RIDUER—Mass T. Kavassa 780 8 Clayton 81. Tyler Teams This invention relates to means for preventing upsetting of bottles on desirs or tables, with a particular reference to ink bottles on achoed children deaks the nain object thereof is to provide such means in a simple efficient and inexpensive form of the for deschable or for permanent or the second connection with a feet or table.

connection with a deed or table

PLM PC—N PALEAT Lynden Wash

The

Invention has for fin object to provide a pump for

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to the pump land manner that the morement of

the propeller driven by the water will operate the

pump and wherehas double pump is provided

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the propeller provided partial partia

WINDOW W. S. Settle be 312 Bort Avo Trouton N. J. The object of this invention is to provide mechanism in connection with the window camern on and the scalines for guiding the scales their movement in the casing without binding sticking and for serving as a parting strip to



permit the usual parting strips to be dispensed with and so arranged that the guide strips may contract and expand without interfering with the movement of the sashes the strips have their sides inclined to facilitate removal and to sliminate splitting when fitting or making re-Daire

pairs PROCESS FOR MANUFACTURING GASER II F FREUERIC CARE OF The Baker Loan and investment Co Walls Walls Was production of cerbon monotide and hydrogen The object is to provide a process for making gaser whords a mass of carbon substance is electrically observed for an indicator to the control of the cont

Beardware and Tools
OVAI COMPASS—JH O Barsewamana
790 Hunterdon St. Newark M J Among the
pelicipal objects which the invention has be view
are to provide means for mechanically controlling
the path of a marking resember for preducing an
oral cuttime to adjust the compass readily to

DEVICE FOR HANGING CIRCULAR DEVICE FOR HANGING CIRCULAR ANY BANG-O BOULAR HANGING BURUNDAR ANY BURUNDAR HANGING HA

and is combination with a ring is a spring-present follower which acts on the ring to shreet the same in the arter hole of the saw

BOTARY IMPACT TOOL—M Secre, address Miss D Whitney, one of Title and Trist Co 91 4th St Portand, Ore The Sewanter relates to that class of rook drills in which the relates to that class of rook drills an which the drill steel may be given a rotary as well as an axial movement. One of the main objects is to provide means which will be at all times drive the control of the operator for accomplishing such rotation thereby accommendation the drill is timedifferent kinds and characters of rock and easile bills to see just the accessary force at all singles.

num to use just the necessary rever at all three GAGE —J B Jonus Box 82 Brookville Pa The invention has for its object to provide a gage especially adapted for iswelers use, for measuring uneven surfaces The gage comprises a standard a table supporting the standard a plunger enging



A RIDE VIEW OF THE DEVICE PARTS IN SECTIO supported above the table a plunger mounted to reciprosate in the casing a spring normally pressing the plunger downward means for limiting the downward movement of the plunger and a set serve with the lower end of the plunger

cooperating with the lower end of the plunger PLANT SETERS — AW RARSE 464 PACK St. Upper Montchair N J. The invention relates to horticularial apparents and has pare itsular reforming to gardin tools for the handling of manifest part of the plunger of such plants whereby a plant may be transplanted without being subjected to the shock commonly incident where soil is lowered to the plunger of t

at the roots

TOOL HOLDER—N H GROUP 330 Cricket
Are Ardinove Pa. This lawestion relates more
Are Ardinove Pa. This lawestion relates more
as cross side arranged to ready the the tool
and adapted to be adjusted transversely to the axis
of routino of the holder. The lawestion is
of routino of the holder The lawestion is
of sool holder shaped to be hold in a block surfiel
on a revolving turnet which moves toward the
work the work the work the being rotated in or by a chuck or
this like.

EXPANDING MANDREL -- G RILEY BOX EXPANDING MANDREL—O RIGHT Box 37 Morecol riar Its lieuweitothe has for its object to provide a device adapted for use in lathers and the like wherein resonate spincide is previded having internatibles fis ends a portion rectangular in cross section and apperting from one out to the other together with a artise of sloce adapted to fit and engage the periods to be or panded and contracted by moving the sloce longitudinally

JACK PLATE -H C BARRETTS and R M Masser Binby Okia. The object of skis inven-tion is to provide a device for supporting oil well jacks wherein the plate consists of two portions jacks wherein the baste consists of two portains one canaging the base ble acts cot of the jack reating upon the other the said other place being adjustable with respect to the first managing late In use, the rod of the jack is arranged in the best, or lower section and by means of set screws the jack and beam may be lised up correctly

Jack and beam may be lined up correctly
AUTOMATIC LOCKING DEFICE — O
Femans 720 Davison Ri Defiance. Other Time
invariation relates 40 nut locks, it is object is no
provide a lockible device, stronged to lock a
screwed up mit in place on a bolt to provide a
tut and its locking device, sparker ratio move
does and oblive extransorous matter to allow of
locking the stat whe dolle or at the occurrent parts. of and to permit uncoress It is destrable to do so

#### Harmah

Executable Utilities.

ON VERTIBLE RED. — Bloom, of Nepture Ave Concey Identi, N.Y. Animor principal objects which the lawyed has be view to adapt a child a cut has be view to adapt a child a cut has be view to adapt a child a cut has be view to adapt a child a cut has be view to the control of the cut has been a control or a cut high principal has deed on the cut and the cut has been a consolated as a deligible, and the individual has been a consolated as a deligible, and the individual has been adapted from the cut has been a consolated to be readily for the cut has been adapted from the cut has b



# Born of war's necessities

The war proved conclusively that the magneto is the only form of ignition that is thoroughly reliable under all conditions. It is the only system that does not demand constant attention. It is the only system that does not require costly renewal every few months.

The AERO is the magneto in its highest perfection. This magneto of unequalled reliability and efficiency was developed by Splittforf engineers to meet the war's needs

from all the uncertainties and all the faults of battery systems

As standard equipment on airplanes of the U. S. and Allied Governments, the AERO Magneto won new laurels for magneto ignition and forever settled the question of whether battery ignition can compete with the magneto for any ignition purpose where

for an ignition system that should be free

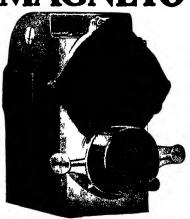
FIRST cost is not the main consideration.

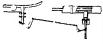
The AERO Magneto is now available for passenger cars, trucks, tractors, motorcycles and all other internal combustion engines.

SPLITDORF ELECTRICAL COMPANY Newark, N. J.

> Sunter Division, 1466 Michigan Ave. Chicago Also Maham of DEKIN and SUMTER, Magazine,

Starter Coupling Makes sterring of the beauty of the start of the start of directly from the starter park, see





A SIDE VIEW OF THE HOLL IL THE WI-

a spring normally traits to trive I said head from the path of the platen. The device is controlled by the saw mild sarriage which engages a reparter the platen has passed the supporting head and causes the head to move against the platen into appointing position

SINDERTHIN (NEW MILES AND THE PROPORTION OF THE PROPORTION OF THE STREET gear rink of the (intrature used in leaf min or rotars kins in ore reliabling and countri work. The gearing comprises a ring having internal and external gear to the fixed bearings for the ring and a shaff passing excentrically through the ring and having a pinion engaging the letth of the

internal goor

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The in name notice of other places

1/1 FWRITER ALTERATION

SIREMEN 4401 Broadway Cheego BE The

Invention rates to a baset that may be quickly

and coadly accured to a typowriting inacline

Mi object is to practice a baset for presenting

give iros in less proximity to the food rollers of typewritter machine and to provide space in the same basket for receiving the addressed

INKING ROLL TRUCK F J BRADLEY and M C DIONEE FORGET Ohio This in intion relates more particularly to an expansible roller arranged to be fitted on each of the Iron ni me f an inking roll. An object is to provide in luking roll truck including a relatively fixed rim with a relatively movable expan-tor one a plurality of expanding segments twated between those members being adapted to the rise the diameter of a lire located between the en und the tim

LABRITAN MACHINE -E R Atung care of Alling Lander Co. Nodus. N. A. This invention has partiallar reference to a machine for tabeling fruit ans. r the like. Among the objects is to provid in any fit controlling a stack. of labels in socia a namer that they will be de-livered singly in successo is to the individual cans as the latter are relied even the stack of labels Another object is to previous facilities for supply

Another others is to provide a men of the lab is pasted to me end of the lab is provided by a revenue of the lab is makine a fairned for the represence in examptent convenience in temporary table. The first interactive is provided a frame or law jointed and the release the plunger to compress the provided a frame or law jointed and the release the plunger to compress the provided as frame or law jointed and the release the plunger to compress the provided as a frame or law jointed and the release the plunger to compress the provided as the fourth provided by the plunger to compress the surface that the surface that the plunger to compress the surface that the surface th

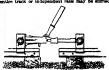
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VERMING and DEVISED

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Prime Movers and Their Acc INTERNAL COMBIGION ENGINE
S Moore New Smyrns Fis The invents relates more particularly to an engine of the four relates more particularly to an engine of the four tyrke type the griftin object begin the providing of an engine of which the four full is supplied to the working cylinder apart from the air necessary for combustion in this device the fluid off is maintained experient from the far until the size and it haredore obviouse many of the difficulties and it havedore obviouse many of the difficulties of the control of the contro

Ballways and Their Accessories
TRACK "HIFTER —W M Wess Remor
Wash This invontion relates to means for use
in a ting and readjusting tracks is has for an
object the provision of an arrangement whereby
satire track or independent raise may be shifted



NIDE VIEW OF THE INVESTION APPLIED TO MAI

quickly without interrupting the traffic passing questly without interrupting the traine passive thereon. Another object is to provide a quickl adjustable gripping structure for use in con-nection with an ordinary jack for acting on the rails and causing the longitudinal movement thereof for resetting or the position thereof.

WINDOW 4 B ZIMMER El (entro Cal The invention has for its object to provide merhanism in connection with the windows of merhanism in connection with the windows of rationed care for permitting the window opening to be completely or partially closed and to bring the partial closure at any act of the easified With the ordinary curtain used in car windows the opening must be at the bottom if a small opening is desired With this construction companies may view the screper or obtain freshell air without the necessity of exposing the estire

TOY MACKINE UUN —J B BLACKERMAN 113 Hotel St Honolulu Territory of Hawali The investion relates to a to, gun in which projection are fed from a magazino and discharged projectiles are fed from a magasine and discharged by a firita plunter which is actuated to discharge the projectile in quick storogation. The object is to provide a sum having a feed silds economiated with a spring proceed fring plunger the two behavior ronirolled by a revisional telligrate in a manner to cause a freed moreometer of the plunger to comprose the spring and then release the plunter.

provide fiesible fixings for same tubular mapses for airmitating articulated junctions and to preduce a toy at a reduced cost. The forms are such as may be turned out by a machine for manufactur-ing wood grills or wooden house.

ing wood grills or wooden heates

ANIMAL TOY—A K WOOLMOVEN 60 Hale

Ave Brooklyn N Y The lawrention relates to
satingal to a mounted on wheels to be drawn along

the floor he object is no provide a toy of the
quadrujed type, and which is exceedingly steedly

and durable (heap to manufacture wide legs

and whosh properly spaced on the sales to prevent

binding of its wheels on drawing the toy along

Pertaining to Vehic DEVICE FOR CONTROLLING SHOCK

DEVICE FOR CONTROLLING BHOOK —
O B BILITAGUARY 800 Blocks Are, Pierre
S D The object of the invention is to provide mechanism for use in connection with motive validates of every character for absorbing shock or per resulting from the movement of the valida-erier the tood and wherein a form of flashble hanger connection is provided for inserposition between the body and the sales or the vehicle

between the body and the azies of the whichs BPBING WHEEL—Las Roy To B Cassin-Stock Hapite lows The lavension has for its provided for importing the resiliency of the specument; the without the consequent cost of the said the and wheem a ponenter-period and wheel and a ponenter-period control is an expectation of the control and the resiliency of the control special ponenter of the control of the control and the rim point of cell springs arranged redistily which the central a short for each pair of springer and means for fluiding and controlling the cut-ture of the controlling and controlling the cutward movement of the shoe

ward movemens of the shore
DOUBLE FUNITY GEAR RET — I. Droaws
and A B Roward Mine Mich. The invention
relates generally to drive measure for automotive
and the B Roward Mine Mich. The invention
relates generally to drive measure for automotive
and the life and particularly to a gree set which
will call the particularly to a gree set which
will call the particularly to a gree and which
wise on 6 a. s. a. s. t. which will combine the feature
of making it to sombte to drive write all four whose
the arrangement being such as to obviste the
necessity of any form of transmission chalm and
permit in 4 direct drive from the gear set to both
the front and reak alles.

DISPENSING SYSTEM — J M PRELAY NOS E McPherson St Kirksvilk Mo This invention has for its object to provide mechanism for permitting a motor valuale to be simuliane. savesnion has no to sospec to provide monaissams for pormitting a motor valide to be simulians-many supplied with first oil and air for the three wherein reservoirs are provided for the heal and oil and tills for containing the air supply pipes the pits being arranged in such manner, that when the veiltle is driven alongsted be reservoir for full and oil the whole will be at the pits.

for full and still the whose will be at the pitts AlR GAGE INDIA GAGE—K B CAST Camphaven Grange Rancho Cal This in vertical provides as attachment for the values of the control of the case of the categor of the cap and a movrable element in a transperient the within the cap

transported tube within the casp
IRMI IRMI (REM) ROUND WHEEL —W G
Pravris 195 St James Place Brooklyn N Y
The lievation has particular reference to ground
wheels for air; lares or like whiches. Among the
objects it to provide a type of wheel the rim
portion of wheln may be riedd but provided with
as earles of flatellot arms or pickes which estand
later-tily from the wheel or in a direction perable
to the last air though on a considerable indistinct from
the last air through on a considerable indistinct, from
the last air through on a considerable indistinct, from
provide means to vary the destibility of the arms

provide means to vary the deathility of the arms LOCK—E. C. LAMPON JERSENSON DIVERSON DIVIDED THE INTERPRETATION OF THE ARMS O

sural monifications of TOP SUPPORTING ATTACHMENT FOR TOP SUPPORTING ATTACHMENT FOR WIND RELEASE J J Owntoness 507 fb. Rei-lar Ave Tacoms Wash The principle soldered fine investical is to provide an actachment for provide the standard standard for the standard standard for the standard standard for the standard standard for the 
RECENTLY PATENTED INVENTIONS

(animod it in pag 1/8)

Mechanes and Mechanes and Performance

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pow generacy conservaces.

UMBREALD HOLDER,—d. & TREPRANI, address Reary Wemachis 1028 for, Eighth 8th Ment-tower Wei The forwarden makes to means for holding an unfredict on a suggest or other vehicle in the formation of the control of the top provide a holder of a chescoter that will permit of the universal adjustances of this universal solution to affecting shotter competer with means to booth the acids in any prime adjust.

VERICLE COUPLING.—R Thrans. Little York III The etject of the invention is to provide a coupling for vehicles designed to be used on all motor and power validies through which power may be supplied from a motor on one of the



BECTONAL PROGRESS YEAT OF THE COUPLING vehicle parts to tractor wheels on which the coupled vehicle parts are mounted it is also possible with this construction to steer the validole with either the forward or rear tractor

ATTOMOBILE ENGINE ATTACHMENT — A
ATTOMOBILE ENGINE ATTACHMENT — A
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to ha had been a special to the ha
the ha belt on the driving pulloy. The fine belt
guide may be used as a handle to grasp the seinchment to hold it in place when applying it or
calculate it off

DIRIGIBLE LIGHTING APPARATUS FOR MOTOR VEHICLES — M CALRINS, B35 Octavia St Apt 3 Ran Francisco Cal The Invection relates generally to a lighting apparatus invention relates generally to a lightless apparatus which may be readily associated with the vehicle steering mechanism so that the light will be never to the right or loft. Upon the turning of the frant wheels with the object of illuminating the read way in advance of the machine. The invention may be tilled vertically toward and away from the readway at any desired angle

the rendway at any desired angle

RPEER CONTROLLED GAR CUT-OFF FOR

MOYOR VEHICLES — J R Com Neshviffe,
Tean. The invention relates presculy to measure

for checking the movements of motor vehicles

the object being the provision of ample unstreamy

effective means adapted to a walved gas supply

ples whereby to cel of the gas supply the means

deverty actuating the valve being in teen on
relied as to their operation and ermindent open
centralist by the spend of the vehicle hard

supply the second of the provision of the second of the

convenient by the spend of the vehicle hard

controlled by the speed of the vehicle lead?

HW Wann 21 4th 88 Razafford, Conn. The
object of the Invention is to provide a prosense we
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now slees or other extransons mester
riab, mow slees or other extransons mester
riab, show the sleep when the volume
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SPRING WHERL -M S. Du CAMERNA.
Donoto, Guera 22 Mexico Mexico The 19
vention has reference more particularly to spring vention has reference more perfecularly is spring wheels for motor vehicles. An object is to pro-vide a simple wheel the resilient elements of the resilient selection of the resilient selection of place of the revised. A first-the objective at the visit a spring wheel which is unreadly at small and the deformation of the stream of parts of the visit of the resilient of the stream of the resilient of the during the movement of state under load increases the resilient of the wheel

# Make Your Plant A Better Place to Work In

When the men come back who have served in the Army, Navy. and Marines, they will be bigger, better and healthier men in every way than they were before.

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FER GAS ENGINE CO.



#### The Principles of Camouflage

(Continued from page 162)
decreasing the visibility of airplanes at present as viewed from below as to increase, the brightness by the diffuse transmission of direct sunlight on clear days. On over cast days clouds and hase must be depended upon to screen the craft

#### Sources of Light

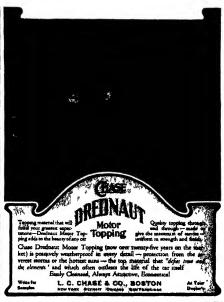
In considering these aspects it is well to recall that the two sources of light are the sun and the sky Assuming the sun to contribute 80 per cent of the total light which reaches the upper side of a diffusing surface at midday and assuming the sky to be cloudless and uniform in brighties then the brightness of the horizontal si face will equal 5 RB where R is the flection factor of the surface and B is th nection factor of the surface and B is the brightness of the sky. On an overcast day the brightness of the surface would I equal to RB. Now assuming R to be the mean reflection factor of the earth this the lower side of a horizontal opaque sur face suspended in the air would receive light in proportion to RB If this low r surface were a perfect mirror or a perfectly reflecting and diffusing surface its bright ness would equal 5 RB on the suray day and RB on the overcast day. The surface overcast day its brightness will be a fra tion (less than R) of the brightness B of the Inasmuch as R is a very small valu if is seen that low vincinity or an incident viewed from below can not be attained in an overcast day it can be approached on a sunny day and even realized by adopt ing the expedient already mentioned With this beginning the reader can make further computations

Seasonal changes present no difficulty s mer and winter need be considered. If the earth is covered with snow an airplane covered completely with white paint would Covered completely with white paint would be fairly satisfactory from all viewpoints. The white paint would possess a reflect is factor about equal to that of a sw the providing low visibility from above. asmuch as the reflection factor of snow is very high the white lower sides of an a plane would receive a great deal of high and would be of low visibility from below ()n clear days when the background was the but say the lower states of the craft an ind be tinted line. This of course holds for a similar consideration in preceding pars graphs but color has not been considered in this discussion be a see the chief difficulty in obtaining brightnesses of the prop r order of magnitude. In winter the barra ground would be of the same color and reflection factor as in summer so it would net be lifticult to take this into considers

Seaplanes whose he kgrounds generally consist of water would be painted of the on) r and brightness of water with perhaps a slight mottling as this is always better than solid color

#### Invisibility at Night

Aircraft for night use would be treat in the same manner as aircraft for day us if the moonlight is to be considered dominant factor. This is one of the case dominant factor. This is one of the car where the judgment must be based a actual experience. It appears that it great enemy of night raiders is the searchight. If this is true the obvious expedient is to paint the craft a dull jet black periments indicate that it is more difficult to pick up a black craft than a gray or white one and also more difficult to hold it in the beam of the searchlight an be readily proved by the use of black an ne readily proved by the use of black gray and white cards in the beam of an automobile headinght. The white card can be seen in the outskirts of the beam where the gray or black cannot be seen and where the gray or black tannot be seen and the gray can be picked up where the black one is invanible. The accence of vision accounts for this as it does for many other questions which arise in the consideration of eamouflags or low visibility Some attempts have been made to apply





#### WILLIAMS'

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# Say it with Howers



FOR THE SICK ROOM

transian Send flowers. They are just the thing to orien brighten the sick room and cheer the sick. er load forist within a few hours oan deliver from flowers in any city or town is the United States and Canada through the Florists Telegraph Delivery bergies.

the principle of confusibility to airplanes as finally developed for vessels to circumvent the submarine but the felly of that appears to be evident Air battles are conducted at terrific speeds and with skilled maneuvering Triggers are pulled with-

out computations and the whole acturity is almost lightnan-like. To expect to confuse an opponent as to the ocurse and position of the airplanes folly. The came unlage of observation balloons has not been developed though experiments were being considered in this direction when the war closed Inasmuth as they are low ultitude craft it appears that they would be best camouflaged for the earth as a background. Their enemies poused down upon them from the sky so that low visibility from above seems to be the better choice.

In the foregoing it has been aimed to give the rader the general underlying principles of the visibility of surplanes. As stated there is a vast amount of data available upon which the development of low visibility for arriplanes could be founded Rowever inassuch as the war closed before a systematic development was achieved practical examples which are Full patter can not be done this subject in a five paragraphs but it is looped that there has been presented a broad view of an extensive subject. In the foregoing it has been aimed to give

#### The German Art of Make Bolieve C nimumi from page 180)

and fitted for breadmaking The cultivation of lupine demands very little care and no fertilizing while its roots enrich the soil to a very high degree with nitrogen

soil to a very high degree with nitrogen
Among other economic discoveries is a
process for making a cament substitute
worth while notiring Common building
line is so treated that it has the same
quality as cement on hardening in water.
The new material has been extensively used
in smaller residences has been found much thesper than cement and seems to prove a valuable and cheap substitute for cement

The eagerness with which Germany has turned to the many substitutes which have been put upon the market has naturally resulted in many disappointments as well as many valueless articles. More than 700 substitute materials have been for bidden sale and use by the Government authorities and numberless others have been refused heense

Taking the substitute materials as a whok one can say that however valuable they have proved for the time being, they can not in the future make up for the im ports of raw stuffs Germany will require nd they can not free Germany from her foreign economic dependency

#### The Mystery of the Boomerang

(Continued from page 178)

to sleep it has found its most constant axis of rotation after a preliminary struggle around what I may call for popular ex-planation its irregular or eccentric ap-

planation its irregular or eccentric ap-proximation to a steady axis of rotation. There remains still to be explained the curve to the left at the end of the outward flight of the boomerang which immedi-ately precedes the great volpiane back to the thrower. This is think, can easily be accounted for on the principle of swerre, as shown in the case of a spherical object in the air or a nurine-stome on the ice. in the air or a curling-stone on the ice

This well-known principle is that the ball edges away from the side that is re-volving toward the point to which it is traveling. On that side the motions of traveling On that side the motions or progression and revolution coincide, that is, they are both forward while on the other side the revolution is backward With greater forward velocity and equal weight on the forward spinning side, there weight on the loward spinning size, there is consequently more friction on that side, and as a projectile always seeks the line of least resistance, the boomscrang, like the ball naturally edges over to the side that us spinning backward It may even be that this is the main function of the

(Centinued on page 184)

LEGAL NOTICES

### PATENTS

JF YOU HAVE AN INVENTION
which you wish to passes you can
write fully and freely to flum &
Co for advice in regard to the best
way of obtaining protection. Please
sond sketches or a model of your in
vention and a description of the
device, explaining its operation

device, explaining its operation All communications are strictly con fidential. Our vast practice extend ing over a period of seventy years enables us in many cases to advase any expense to the olient. Our Hand Book on Patents is sent free on request. This explains our methods terms, etc. in regard to Fatents, etc.

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etc R Mich

BURINESS OPPORTUNITY

FINANCIER Wanted to promote cale of h
inflors ash effor Anxious to manufacture to
inter the illustration page 17s. J Rossi,
sub sitrest, New York Oily

CHEMIST WANTED FIGT with practical experience in the Imitation leather, capable, of taking an Hearth-Light, 400 Fourth Avenue

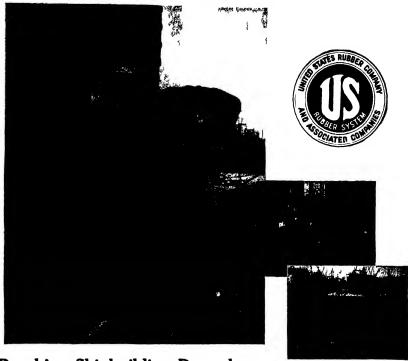
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g plant making artificial seather Give full par
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# Breaking Shipbuilding Records

From Seattle to Philadelphia the stutter of thousands of pneumatic riveting machine rends the air. White hot rivets under the feverish urge of compressed air holt plate to frame. Soon another hull takes the ways and adds to Uncle Sam s ship tonnage.

Trailing serpent-like from the riveting "guns to the compressors are long gray lines of United States Pneumatic Hose Air tight and kinkless it is, delivering every ounce of air that the pumps register

In those dark days when the Bridge of Ships was the one vital line of communication between our shores and the Western Front, American shippards responded with record-breaking launchings

Spark counted for most But it will not be demad that United States Pneumatic Hose was a very important factor U S '4810 helped make those riveting records possible

Light strong and flexible it follows the riveter and his bucker up wherever they go Dragged over rough places trod upon by man and horse, run over by cart and truck its all in the day's work 4810 stands all kinds of abuse, without bursting or getting flat

The United States Rubber Company makes good Rubber Hose for every purpose -air gas steam, dredge fire garden, etc

Tell your hose problems to our ne rest branch They will be thoroughly analyzed by specialists and recommendations owered All without involving the slightest obligation on your part

Your assurance of superior service is in dealing with the largest rubber manufacturer in the world, whose quality mark is the well known U S seal. Let that seal guide you in all things pertaining to good rubber goods.

Inserts photographed at Hog Island Courtesy American International Shipbuilding Corporation Large picture shows man reveting marine boiler

# **United States Rubber Company**

Mechanical Goods Division





ROCHESTER N Y

## The Mystery of the Bosnerung

(Continued from page 183) angular or raised side of the boombrang, for it stands to reason that this side gets much more friction than the flat side sides. And more friedon than the flat side does And it gets it in presteasily the same manner as a baschall or any other agianing sphere of the same and the sa

mains for an appreciable period in one plane.

There is another factor that entere largely into the alteration of the mitial plane of flight of the boomerang. The first state of the plane of flight of the boomerang the first side of a right-handed thrower an I large throw is surces the body, and this lays the boomerang over a lattle out of the vertical plane of rotation I i follows quite naturally that on the upward and forward quarter of the "area" formed by the rotating boomerang there is more friedon than only the see- see- orterating mechanics of the large than anywhere see- overtainty mechanics and the large through the protein product of the through the protein product of the plane of rotating boomerang there is more friedon than anywhere sees-- overtainty mechanics. The protein product of the plane of the

#### Eliminating a Railroad Waste

(Continued from page 178)

The high cost of wiping waste and rags brought about by the war has induced American manufacturers to give up the practice of burning these articles after use,

As interesting of the standy overalls. This is done, as a griftly spidner a change of some control. This is done, as a griftly spidner a change of the orante per piece, which is shown one-shoot ment has prevent every sufficiently. Some several points of view, such the issue against and which is kine high popularization of universally clean everalls is ne-flected in a cleaner general appearance of the shop. Insidentally, the indices of the workman's families appearance of the shop landsontally, the indices of the voorkman's families appearance of the shop landsontally, the indices of the voorkman's families appearance of the shop landsontally, the indices of the voorkman's families appearance to the orange of the unique shop of the supplementation of the unique shop of the supplementation of th

### Issac Hill Bryant

paul of gravitation coincides with the present is strongly apparent that the result is strongly apparent that the result is strongly apparent that the result is strongly apparent to that the result is strongly apparent to the third of the cuttered should appear quite natural, too, that the boomerang abould take the influence of these forces suddenly and markedly, as it does at the sund of its outward fight. We are well acquainted with the principle but and the most emphatic way in the fight of the most emphatic way in the fight of the parched ball travels straight up to the plate, and is a success in proportion to the sharp-ness of the break' which it develops when it gets there So it is in the fight of the boomerang, but in this case, the spin has the should while the rate of rotation has not worked with the force of the fight down to the feet of the person when the spin in this case of deflection, that the boomerang veravitity to the left and of spin in this case of deflection, that the boomerang veravitities of the left and of spin in this case of deflection, that the boomerang veravitities to the left and so that the left and the properties of the fight down to the feet of the person who there were a bank of sail down to the feet of the person who there were a bank of sail the way to be properly the way to be provided to the fight down to the feet of the person who there were a bank of sail the way to be provided to the force of the fight down to the feet of the person who there were the sail the Northwest it is accompanied by sharmstone. Other articles in this strength is appear as that on The Chemistry of Shape, Phetographic way the sail of the Northwest is accompanied by sha as an Economic Measure discusses a method for utilising the present enormous wastes that attend lumber production, especially in the Northwest. It is accompanied by pilastrations Other articles in this issue include The Trim of Shape, Photographic Copying, On the Essense of Physical Relativisty, and A Museum us a Leboratory

#### Why Bread Gets "Stale'

brought about by the war has induced American manufacturers to give up the practice of burning those articles after use, and like M Graon, to install laundry equipment which will restore these fabries be a revealed for more than a system of the control of the c



## Friction Disk Drill

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FOR LIGHT WORK Hos These Groot Advantages, peed can be instant y classed from it stompping or sk I say be in Power as dead of a w th equal colory the contri is with! It range a weaterful out dri is with! It range a weaterful out dri is with!

W. F. & Juo Bernes Company Semilabet 1872 100 Rates Street Rookford, Mine



## Specialists in Small Wire Shapes & Flat Stampings into wine grapes if they were not made Bridgeport, Conn.

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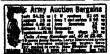
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ne to-chap Remomber we'll send port E SCOTT V. MEDICALD CO.,

other things being equal the crumb will remain fresh and soft and retain its flavor if the surrounding temperature be kept at eixty to seventy degrees Centigrade (140-158° F)

Mr Kats found by direct experiment that bread taken from the oven and kept for 48 hours remains fresh or grew state

ing manner
In all instances if the temperature did n it fall below 60° C (140° F) it remained perfectly fresh while at 50° C (122° Γ) it began to get stale and the lower the it began to get state and the lower the temperature the more lapid and the more con-licte was the change to staleness reaching its maximum at about 2 below sero C (286° 1) (slightly below freezing point) Most unexpectedly however as soon as this point is passed the bread immediately shows a tendency to become fresh once more At 8° C below sero (176° F) it is only half stale while when the temperature of liquid air is reached it is absolutely fresh though naturally it can not be said to be edible. The practical conclusion to be drawn from these curious experiments seems to be that bread should be placed in some receptacle such as a fireless cooker for example immediately on being removed from the oven where it can be kept at the required temperature

until required for use

It seems possible that the problem of
workless Sundays for bakers might be solved in this manner

#### Syrup from Grapes

DURING the agretation for prohibition in California one of the really vital problems concerning large sections of the state was what to do with the immense

There are large areas of land in Califor There are large areas of land in Califor ms on which little else but these grapes will grow so the problem was how to prohibit the manufacture of wine without bringing undue hardship on the people engaged in growing the grapes are considered fit only to be on verted into wine.

The Areantistical Californ of the Illing the control of the Illing the Illing the control of the Illing the control of the Illing the control of the Illing the Illing the Illing the Illing the Illing the Illing the Control of the Illing t

verted into wine

The Agricultural College of the Uni

versity of California took up the problem
and has devoloped in its laboratory a

practical method of converting grape juice
into excellent syrup—an article so much
in demand in these days of sugar conserva
tops.

The University claims that the conver mon of grapes is to syrup instead of wine will double the value of the grape crop of the state that the 259 000 to a of grapes now worth \$4,000,000 whose market will be cut off by war prohibition in 1919 if made into syrup would be equivalent to 40 000 tons of sugar of a present value of \$8 000 000

At the same time an independent chemist aid grape export has succeeded in produ ing a syrup from grapes which is declared to n set all the requirements of a practi al con mercial syrup According to figures which he submits his method will product svrug at a slightly less cost

One of the most interesting fratures of One of the most microting fratures of that question as the plan recommended by the University that all grape growen winerse and squar factories cooperate next year in the interest of all these in dustries it proposes that the winerse purchase the grape of the vintage of 1919 and extract and store the estimated 50 000 000 gallons of purce the larger control of the 
will prevent fermentation for a year in necessary The bulletin states that this syrup can be used in place of sugar in preserving some fruits and mixed with sugar for others Not only will grape growers and win-

(Continued on page 198)



### The Design and Construction of Induction Coils By A PREDERICK COLLINS

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This work gives in minute details full practical directions for making eight different sizes of coils varying from a small or e g ving a 34 inch si ark to a large one giving 12 inch si arks. The d mensi ns. f each an l every jart are given and the descriptions are written in language easly e mprehended

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#### SCIENTIFIC AMERICAN

portion as its dipart each by the rake and adoptating as its lower rad between the teeth of the rake wherein mount is provided for varying the a gi-of the plan of the iself with respect to the ground and wherein means is provided for in suring the positive unloading of the sweep when

BEEHIVE—E E SCHUMER Hilliert Wis The invention relates to a 1 c lilve whi 1 on prises a beach housing and a cere will trood nest An object is to provide a simple and



A SECTION THROUGH A BERRIVE AS INVENT efficient hive which can be easily inspected an

which will give access to the broods nest at any time without materially interfering with the working of the bees

CUI IIVATOR—R O Dot an Millereburg, Ohlo This invention has for its object to provide a divice especially adapted fire rullivating own wherein means is provided for harrowing the ground upon each side of the row to break up the ground upon early side of the row to break up the crust and form a mukh without disturbing the code of the proving plants and dasplot to be used until the corn is laid by

IRRIGATION CHECK—C W Rice Twin Falls Idaho An object of this invention is to provide a movable and adjustable irrigation check formed with two vertically reciprocating cases formed win two verteally reciprocating wings operating in conjunction with two cross-levers and a canvas attached to each wing to fit any irrigation ditch that will raise the water in the ditch as is necessary for taking it out of the ditch and on the land and also provide a passage over and through the check for

REVERSIBLE IRRIGATION BOX -G W Rice Twin Falls Idaho This invention re-lates to a metallic irrigation box for taking water lates to a metallic Irrigation box for taking water out of a ditch and controlling the volume as required. The box face has an adjustable wire scene to keep rubhish from stopping it up. By cutting a bole through the ditch bank one may force the wings or face of the box in the bank and forwing the projection or lower side of the box into the earth in the bottom of the preding. The box is so constructed that it is reversible

#### Of Concret Interest

FOUNTAIN PRIN — E G Wood? 470 Put-nam Are Brooklyn N Y Among the principal objects which the invention has in view are to objects which the invention has in view are to object and the principal of the link at the beginning of the operation of writing and to simplify the construction. The desired result is accomplished by pressing a button at the upper end of the pore, which forces a small supply of last under the noils and pair them is condition. to commence operation

FOCAL PLANE SHUTTER - F C BASE FOOLD PLANK SHOTTER - F CHANG 30 W 59th 81 New York N Y The invention relates to photographic cameras its object is to provide a focal plant shutten arranged to permit of accurately and positively making exposures in rapid succession. Another object is to actuate the shutter from the film feeding mechanism to operate in unison with the latter. The shutter is controlled by the film feeding mechanism so that the exposures are made at the proper time that is when the film is at rest

IORTABLE HOLDER -G Comson 650 W 10th All F New York N Y The object of the Invention is to provide a portable holder designed for use in the home hospital or when travelling and arranged to permit of surving a number of bottles filled with milk or the fluids together with nipples and o her accessories for the needs of a baby or invalid during a Journa v to keep the contents of the bottles in place condition by refrigeration and to allow of conveniently heating a filled bottle prior to feeding the contents to the

person

CONSTRUCTION BLOCK JOINT—P

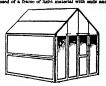
GLENNIE IT Massechusetts Ave North Andover
Mass An object of the invention is to provide
a simple construction block which is particularly
adapted for concrete blocks and which is charcoterised by the provision of sinuous grooves

are joined CIGARETTE CASE—E CLEAREDGE, 886-888 Butter St Brooklyn N Y The general spect of the invention is to provide a case which primits of the easy and convenient placing of the chartten thresh without danger of their being permitted or there dealy such conveyances passed upon the conveyance passed upon the conveyance passed upon the conveyance of half sections. In the case can be completely opened, none section of the case can be completely opened, none section of of the case can be completely opened to see the case can be completely opened to a line so that the case can be completely opened to a line so that the case can be completely opened to a line so that the case can be completely opened to the case having make a range of he is line so that make the case of the cas

VFORTABLE GLUE OR ADRESTUR—O. Benouter case of F W Tunnel & Co Inc. 15 N 6th Nt Philadelphia Pa An object of the invention is to provide an adhesive forming a thick smooth pease which on drying gives a clear thin in place of the nursal dull peague fishes. The process of making the starch compound consists in treating hydrolysed starch or its derivative with formsidelyde and an ammonium compound quantity of which does not exceed 2½ per cent of the quantity of which does not exceed 2½ per cent of the quantity of starch by weight VEGETABLE GLUE OR ADBESTVE -- C

OHECK BOOK—B L HOLLISTER, Aithen Minn An object of the invention is to provide a small compact check book including a series of pages in which check blanks and record blanks pages in which check blanks and record blanks and alternate throughout the series and of which the check blanks alone are detachable and the record blanks are provided with spaces registering with certain of the spaces on the check blanks whereby written data is the spaces on the check blanks whereby written data is the spaces of the latter may be duplicated by the use of carbon or transfer paper in the corresponding spaces of the former.

PORTABLE CAMP—H TRIBBERN and B LAUE 2727 McKinley 81 Davemport Iowa The invention is especially adapted for the use of automobile and camping parties being composed of a frame of light material with ends and



A PERSPECTIVE VIEW OF THE CAMP SET UP side walls and a roof which are so connected as to form a rigid structure and adapted to be dis-connected or collapsed the sections folding upon each other alternately and in opposite directions

for storage and transportation.

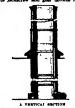
DUMMY ARRIAL BOMB—E V Karssov
Forth Amboy N J The invention relates
portionistry to dummy bombs utilised in the
training or insecurcion of bomb deepports the
object to be possible to the possible to be the
body of the bomb from plantic masterial and
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\*\*FILM MOUNT—W L is suizon 107 Haw
thorne 8t Hot Springs Ark The invention
has fire to object to provide unchanklers especially
adapted for mounting X ray dental films in such
manner that they may be easily viewed by treamnitted light. The mount comprises a sheet of
overloads and they are the suited opening askid opening on the firm of the film.

the dim 
SIPHON CHEAM REMOVER—J H Cours 
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RECENTLY PATENTED INVENTIONS addapted to be disposed vertically and into which produced to provide a series of the content tery may be cent which would jeek the land and the which produced a tele-gainar so not relative the weight of of objects at the injuries as not relative the weight of object of the invention is not provided as sweeping and the invention is not provided as a tele-gainar sendence to which the blocks on the underlying blockers are which the blocks on the underlying blockers are the provided as a telegraphy of the plan of the plan of the plan of the plan of the trift with report to the strike of the plan of the trift with report to the strike of the plan of the trift with report to the strike of the plan of the trift with report to the strike of the plan of the trift with report to the strike of the plan of the plan of the trift with report to the strike of the plan of the trift with report to the strike of the plan of the trift with report to the strike of the plan of the plan of the trift with report to the strike of the plan o



the extensible section said device being located externally of the stack so as to be protected from the stack gases but also so located as to be protected from the weather Another object is to provide a housing for the jackscrew and sear devices

gear devices:

REUISTER—C G Sunnan, 104 N 8th
Receis Richmond Va One of the principal

objects of the invention is to provide a pocket
register which will be of particular use to traveling
malement. Another object is to provide a register,
having a series of disks adapted to register having a series of disks adapted to register the total amount of expenses and having a second series of disks adapted to indicate the amount of expenses during any particular space of time means being provided whereby the second series of disks may be set at sero without affecting

the first series

REWEE CONSTRUCTION —W B GAAY

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pervise a conduct of models blocks arranged in 
such manner as to provide a maximum of resist
ance our rows in any direction wherein an times

and an outer series of blocks is provided the

placement in any direction and being locked to

the tembers of the other series against displacement in any direction.

mess is any circums.

FIERMOSTATIO FIRE ALARM—H H
CAMP Spencer W Vs. The Invention relates
more particularly to a thermostate mamber for
use in connection with electrical slarms of the
and other type the object being the provision
of a thermostate circuit making alarm member
which will be at once simple in construction and
strong and durable in use

LENS SHIELDING ATTACHMENT FOR (AMERAS—B M TAXABASH Harlowton Mont The invention relates generally to (ameras but particularly to a less shielding atcribed in patent 1 262 137 grante



processing complicated parts of the construction, the PORM FOR POR CONCRETE VERSELS—

O P KENDONS, El PARO TORRET THE INVESTIGATION OF THE LOWP, 18 Post Ave New Avenue of the Control of

Employee and Foote CHECK (FINGE-SE PLANCASHER, 511 Webster St., San Prancisco Odi This Invention has for its object to povotia a bance which will anomatically class has door when it has been mechanics by provided for enthering the single movement of the door. The hitspe constrat of a casting composed of a section foreign a chamber for liquid having councied with the lower and thereof a section framing a chamber for hidge the principal will be suffered by the principal chamber of the section framing a chamber for hidge the principal will be suffered by the principal will be sufficient to the control of the section having threaded evaperation.

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PRINTING PRESS — A J. Saurus, 90 W.
120f. St. Apt. S. New York N. Y. An object of the invention is to povede a printing press
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whereby stake shewledly indicate to the provide
a gas turner having a supply wave controlled
a gas turner having a supply wave controlled
scopping and starting device of the printing
press to automatically turn on and shut of the
gas supply when the press is started and stopped
STONE CUTTING MACHINE—O W
KROW Major Aven Straighted Chardeas Queens,
a machine for cutting grantice or ther states to

N Y The object of the invention is to provide a machine for entiting grantic or other stense to oranament the floor thereof according to a pre-determined feather without recurring understanding the control of the con

simultaneously feeding the chiesis up or dewn.

OFFRET WISE OLEANER FOR PRINTING.

PRESS — M THEM. 1023 Jackson Ava.,

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the invention are to extend the nearful life of

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month the web before introducing the same to the

packing roller to provide apparatus for the above

stated purposes which are interchangeable, and

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designed and to prevent the insertion of a coin

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VILLAGENIUM, PRESE — and and a coin of the 
VULCANIZING PRESS—P and B DE MATTIA Gardeld N J Among the principal objects which the invention has in view are to objects which the investion has in view are to provide heat-retaining means for surrounding moids used in vulcanting rubber articles to provide a press with a chamber for preventing, the rediction of heat from the edges of the moids and articles contained therein to provide means for applying an expandra-heating medium to the moids and to provide a simple durable and efficient cabinet and full-open-door therefor

ancient canner and rule-open-door therefor SYLLABIC TYPEWRITER—L Trout, Rome, Italy This invention refers to typewriters known as 'syllable typewriters which permit of contamporaneously printing several letters One of the objects is to provide a typewriter of this of the objects is to provide a typewriter of this class which will permit of printing at a strake two, three or even more letters or signs arranged in any way whatever without preventing the use of the single keys in the same manner as in the ordinary typewriters vis for printing a letter or sign at each stroke

ordinary typewriters win for printing a laster or dem at each strucke SILENCER FOR VALVES—M C DAPT 128 R 1045 R. New York N Y Among the SI R 1045 R. New York N Y Among the SI R 1045 R. New York N Y Among the SI R 1045 R. New York N Y Among the SI R 1045 R. New York N Y Among the SI R 1045 R. New York N Y Among the SI R 1045 R. New York N Y R 1045 R. NEW Y R 1045 R.



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#### Syrup from Grapes (Continued from page 188)

grees he benefited by the greatly more sed walue which the syrup industry promises to give to grapes, but if the sugar factories will convert the jude into syrup, which they are well equipped to do, they will be kept running several months longer each ar litherto, the sugar beet "cam-DRIED page as the sugar making season is called his only lasted about three months so this plan would seem to be a distinct advantage to the factories The State University is a high and con-

are rease university is a high and con-servative authority, so it seems very nearly certain that the solution of this vexed problem is at hand, and that it is to be solved in a way more satisfactory than we

#### The Economic Effect of the Loss of Alsace-Lorraine

THL economic loss to Germany involved decursed by Dr Felix Pinner, the financial editor of the Berliner Tageblatt, in a recent that the acceptance of the terms of President Wilson has given an international aspect to the Alsace-Lorraine question and suggests that it might be worth examining the economic value of that territory to Germany He points out that Alsace-Lorraine is not only one of the most highly developed manufacturing parts of Empire but also, what is more important, one of the chief sources of raw materials with which Germany is not any too well supplied

The mere loss of a manufacturing indus try, no matter how highly developed, is far less serious than the loss of a supply of raw materials Manufacturing industries bas largely on foreign raw materials may be easily trunsplanted, the productive forces, cashy transplanted, the productive loves, the capital, the enterprising spirit, the technical training and commercial con-nections involved are comparatively mobile and may be restored after overcoming a and may be restored after overcoming a certain amount of disturbance during the period of transition. The loss of raw materials, on the other hand, is final and irreplaceable. The mer mention of ore, potseth and petroleum is sufficient to indicate the significance of Alsace-Lorraine as regards to raw materials

As to pstrokum, Alsace produced prior to the war 42 per cent of the total amount of 120 000 tons of crude oil produced in Germany, and while the yield has increased somewhat lately, it is still of slight importance as compared with the total German consumption of petroleum. The potash deposits are of far greater importance, both in economic and politico-economic point. It is true that the potash etandpoint standount it is true that the potsen deposits in the other parts of Germany are more than sufficient for domestic consump-tion and export. But the loss of the Altion and export But the loss of the Al-satian deposits (about 10 mines belonging mostly to the German potash syndicate) will deprive Germany of the world monopoly which it has heretofore enjoyed and take away from it one of the few weapons of economic defense

New York, M. Y.

While the statements in the Allied press to the effect that the Alsatian deposits will be sufficient to provide potast for all countries outside of Germany may be exaggerated, the fact remains that the loss exaggrated, the fact remains that the loss of these deposits is of extreme importance. The potash monopoly, the writer asserts, enabled Cermany not only to fix the prices for foreign markets above those for domestic consumption, but also to offer an important product in exchange for raw materials produced by countries depending on German potash The loss of the Alastian

ing development of the German iron and steel industry would be untblinkelike. From a few million tone the German iron and steel production increased within the two decades preceding the outbreak of the War to 19,000,000 tons, far outdistancing the Britain production and bump [0,000,000 tons behind the American production The importance of the Lorezine deposits is not indicated by the iron and steel produc-tion of Alsace-Lorraine (2.288.354 tons). tion of Alsace-Lorraine (2,289,354 tens), but by the fact that the entire from and steel industry of the western part of Germany, particularly in the Rhomsh Westphaths and Shar distrots, depended to a large actent on Lorraine numette The Lorraine and Luxemburg mines (the Luxemburg mining industry being closely connected with that of Lorraine and the separation of Lorraine will probably mean the loss of Luxemburg as a member of the German Customs Union) supplied in 1913, 28,500,000 tons of iron ore out of a total of 35,000,000 tons for the whole of Geror 35,900,000 tons for the whole of Cer-many, or 77 per cent on the base of metallic content. The loss of Lorraine would, therefore, mean that for a large part of its iron-are needs Germany would depend on from needs Germany would depend on foreign countries, while in 1913 it imported foreign ore from Sweden, Spain, Russis, and, perhaps, even from France, but the narrowed to such an extent as to endanger

its maintonance and further development. In considering the Alsace-Lorrance side of the question, Dr Pinner points out that the restoration of that territory to France does not necessarily mean the transfer of Germany's position in the iron and steel industry to that country. It is claimed by the writer that France has neither the by the writer that France has nother the organizing ability for large-scale industry mor the fuel supply required to maintain as extensive iron and steel industry. He sites the backward state of development off the De Wendel buildings in Lorraine, recently confined by Cermany, as proof of the lack of enterprise on the part of the Franch holders of ere deposits. He also states that in spate of the fact that the Franch portion of the minette deposits was larger than that involved in the loss of Lorraine in 1871, the iron and steel industry of French Lorraine could not stand in comparison with that of German Lorraine Only a small part of the ore mined at Bries and Longwy was used in France, and t and Longwy was used in France, and the remainder was exported in a raw state. The writer admits that this was not due entirely to the lack of enterprise on the part of the French industry, but partly to the lack of coke, and calls attention to the arrangement in effect before the war-by which German coke was exchanged for French ore. The transfer of the Lorraine iron industry to France will still further increase the French demand for coke, and although some French writers maintain that the requisite supply might be obtained from Great Britain, Dr Pinner points out that it will not be to the adpoints out that it will not be so this acreamage of that country to further the development of a rival industry in Lorraine, even if it should belong to France.

#### Airplanes and Seas Navy in Wartime

THE activity of arribanes and seaplanes
Tued by the United States Navy during
the war for overcoming the submarine
menace is one of the most interesting
chapters of history about which, for
"tactical reasons," little has been published
to date Now that the war has been wen,
however, naval officers are actisfying the
washes of interested organisations by however, naval officers are actualying the wishes of interested organisations by describing and illustrating just what has been done to make America's participation in the war so officetive At the annual meeting of the Society of

independent export policy of Germany as At the annual meeting of the Society of regards potach and will farcs it either to New York, Commander H O Richaedson, set privace or enter an agressment with the U S N, presented a highly instructive The most severe blow will be the loss of the iron-ore deposits. It is east to state the third that the solution of the Lor-Society are commented, of the Particular Comments of the privacy of the property o



## After the First Real Test

After the end of its first season of hard service—after your motor vehicle has traveled 3000 miles or so—after your tractor has plowed harvested and threshed after wear has begun to cause looseness here and there—

Then comes the real test Up to this point most electrical systems do all that is required, but beyond only the best can possibly be good enough

The doctor's car then, if ever, will show signs of weakness that his mari mum demands—frequent starts, short runs—would emphasise in the system that supplies current for starting, light ing and sgntion

The long haul truck will have de veloped some electrical weakness unless its equipment is built to stand long trips over rough, difficult roads

The tractor in particular will by then have shown in its hard field work, if there is lack of proper design and con struction of its electrical component All three of these services mean short life for the battery and a short road to a crippled electrical system unless generator and motor are particularly well fitted for their work

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Airplanes and Seaplanes of Our Navy in Wartime (Continued from page 188)

(Continued from page 188)
of work during the war, and it is to be
expected that the lessons learned will be
splined by them in the construction of artceast to be used during peace times as well.
Community Ritherdron states that the
companitive inservity of the German and
Austinian fixed practically reduced the
action of our asplanes to cooperation with
the Allied feets. Coast sixtonia were
cetablished in Italy, Prance, Great Britain,
back of operation from almore
Simon some of these bases were subject
to attack by cump planes, the Navy had

to attack by enemy planes, the Navy had to have also land machines for the protecto attack by can my planes, the Navy had to have also land reaches of rot the protoction of such is tablishments. In his paper (
Commander litherations gave a description of such is tablishments. In his paper (
Commander litherations gave a description of the control of the Four and the Dellaviland-Nine For training of pilots the Curtis N-9 was in training of pilots the Curtis N-9 was in favor, equipped with the Curtiss OXX 100 horse-power singin. This is a hiplane with a single center float and wing tip balancing floats. The Curtiss F boat also

balancing floats. The Curtiss F boat also was used for instruction. The Commander explained that while in general there was no great difference in the design of land machines and esaplanes, the weight of the latter was necessarily the weight of the lastic was necessarily greater and required a different landing gear and apparatus enabling the scaplane to leave the water and take to the air A number of charts were shown to illustrate the performance of varous planes taking into account the lifting capacity, speed through the air, resistance to penetration of air, and the power required for traveling at the performance of the penetration of air, and the power required for traveling at the penetration of the penetration of the uncertainty of the penetration of the penetration das usered. With a Laberty engine develop-ing 380 horse-power at 1,000 revolutions per minute, a speed of 80 miles per hour was attained attained

Considerable development work was done to determine the most advantageous form of float lests were made in the model basin at Washington, using models one-twelfth the normal size. When the tests were repeated with full-sized floats, the results were found to check accurately The Commander advocated the geared-

down propeller arranged to turn at 60 per cent of the speed of the engine. This would allow the use of a 11-foot diameter propeller instead of the 9-foot, and would raise its efficiency from 69 per cent to 73

The H S-1 is capable of carrying a load of 6,500 pounds at full speed The H-16 is a twin-engine seaplane It carries a pilot,



paper when corresponding about such a patents subscriptions, books, etc. pasents subscriptions, books, etc. This will greatly facilities carrecting your questions, as in many cases they have to be referred to expects the full man and address should be given in left with the full man. And the should be given the state of the said to un regard question. Full hists to correspondents are printed from time to time and will be mailed on This

(14299) J. A. F. anks. About a year ago I in the strip is varied by the vibrations of the micro-phone transmitter. It would seem to be too deli-cate for rough use as a telephone. The instru-ment is described in the Scientific American Vol. 114, No. 4 dated July 24th, 1915.

(14300) G E O asks: Which has produced the higher degree of temperature, an abstract numeso or an onz-anotelyne blow torch! A The oxy-acetylene fiame is usually set at about 5 000 degrees Pahr, and the electric are at 6,500-7 000 degrees Pahr.

(14301) J D k. aska\* Is the decrease of resistance in a carbon sheath due to the fact that pressure causes better contacts between surfaces of carbon blocks, or is it shought to depend also upon some internal change? Roor spreat a variation of resistance can be produced. What other substances besides carbon are or can be used and in particular it there any substances. be used and in particular is there any substance which satisfies the safety whose used not in numerous hiocks but as one solid piece? Can you rake me to any discussion of these phenomena either in Neurarrays. Ausman as consisting of many thin plates act aimply by pressure, which brings more surface into contact and theorether reduces the surface into contact and therefore reduces the resistance There is no internal channe We do not know the rate of change with pressure to the contract of the contract of the face the size of plates and their routhness or smoothness would be involved in the determina-tion. We do not know that any other material is used in this way. Metak are too hard to yield to pressure, and non-conductors are out of the question. We do not know any articles on the subject.

(14302) G R T saks. We have been studying about the pressure of water, and are anisous to know the variance of pressures at mid-ocean that is, the difference in pressure from the top to the bottom. We are also wondering what became of the "Thatolo Is it probably intact in the spot to which it sush, or has it been musted ber cett
The HS-1 is capable of carrying a load of
6,500 pounds at full speed. The H-10 is a
twin-engine segulanc. It carries a pilot,
an observer and a "wireless operation" in the speed of the speed

## 74th ANNUAL REPORT W YORK LIFE INSURANCE COMPANY

346 Broadway

New York, N. Y.

## To the Policy-holders and the Public:

Any intelligent man knowing that he must immediately go to war would take any life insurance policy for almost any amount

offered by any responsible company at any reasonable pirice.

It gives us all something of a shock to realize that the deaths in our army during this unprecedented war just closing have recently

urpassed many times over by the epidemic deaths in everyday life
Influence we are told up to January 1 1919, had already kulled as many young and vigorous persons in the world generally as were

innuense we are cone up to samuary 1 1919, non stready kine as many young and vigorous persons in the world generally as were killed by bullets and disease in four and a half years of the war I

The wisdom of an adequate surplus in life insurance is now demonstrate! The folly of New York State in imposing a severe limitation on surplus—against which this Company especially protested in 1906 and since—is also demonstrated

Through a period of years the mortality of all soundly conducted companies in spite of influenza and other unforsen calculations,

will mall likelihood come well within the tables but we now understand that incidents can arise through which mortality may temporarily exceed the provisions of very conservative assumptions. It is comforting to know that neither war nor influenza can make any insterial difference to you as a member of this Company, because as against such starting incidents this Company long since made abundant provision

From this there are two fair deductions

First-INSURE-there are just as many and just as sound reasons for insuring your life during days of peace as there are for mauring during times of war.

Second—insure in companies that have aimed above all things to achieve safety. In these days SAFETY sounds better than CHEAPNESS.

Our mortality up to the outbreak of influenza promised to be in 1918 about 61% of the mortality provided for in the premiums it was actually 95% of the expected. If this epidemic persists during 1919 your so-called dividends may be reduced in 1920—they remain substantially unchanged in 1919

New Business of the year chiefly from the United States and Canada \$340 000 000 The largest new business in the Company a history Received in life insurance premiums 110 000 000 Paid policy-holders Death claims \$35 000 000 To living policy-holders 62 000 000 97 000 000 We bought so many Liberty Bonds during the year that we were obliged to borrow from the New York banks Our statement shows, on that account Bills Payable 22 800 000 70 000 000 30 000 000

December 31, 1918 we owned at par Liberty Bonds aggregating Bonds of the Allied countries, issued since the war began Total war bonds owned

The Balance Sheet follows

DARWIN P KINGSLEY President

\$100,000,000

## Balance Sheet, January 1, 1919

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Dalatice                           | Silees                                                                                                                                                                   | January 1, 1010                                                                                                                                                                                                                            |                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| ASSETS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |                                                                                                                                                                          | LIABILITIES                                                                                                                                                                                                                                |                                                                                                                               |
| Real Faste Loans on Morrgages Loans on Policies Loans on Collateral Liberty Bonds Bonds of the Allied Countries issue Other Bonds and Stock Collateral Liberty Bonds Liber | ms<br>ed<br>Insurance Bureau under | \$13 449 600 00<br>160 053 804 71<br>155 114 802 36<br>718 550 00<br>69 791 491 96<br>00 968 201 77<br>508 957 595 13<br>22 242 580 17<br>18 647 771 41<br>15 105 402 62 | I hex Reserve Oft r I by I slabituse I ren unn s Interest and Rentals prepaid Con I veson's Salarias etc. B frowed Money and Accrued Interest thurson Divident by payal in 1919 Reserve for distried Dividenda Reserves for other purposes | \$756 695 852 0<br>29 571 140 5<br>4 515 533 0<br>3 876 245 9<br>22 463 879 4<br>32 63 614 1<br>100 893 328 0<br>44 033 682 6 |
| Total                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | •                                  | \$995 087 284 86                                                                                                                                                         | Total +                                                                                                                                                                                                                                    | \$97 03 -54 8                                                                                                                 |
| INC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | OME. 1918                          |                                                                                                                                                                          | DISBURSEMENTS, 1918                                                                                                                                                                                                                        |                                                                                                                               |
| Premiums On New Policies On Renewed Policies Annuities, etc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | \$13 971 187 19<br>91 806 610 18   |                                                                                                                                                                          | Payments to Pokey holders Death Losses \$3:070 157 (1                                                                                                                                                                                      | \$97 609 856 20<br>863 572 06                                                                                                 |
| Interest and Rents Money borrowed to increase Co Fourth Liberty Loan Other Income                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | mpany s subscription to            | \$41 500 876 98<br>24,000 000 00<br>3,246 707 28                                                                                                                         | raud to Agents and for Agency Expunses, Medical I cos etc.<br>Law: Lauraness and Insurance Depts I res<br>Borrowed Money repaid<br>Other Dabursenments moluding Real Fatato Expenses and<br>Taxes                                          | 12 846 633 2<br>2 2 2 7 320 5<br>1 320 000 0<br>7 664 525 0<br>50 180 172 40                                                  |
| Total                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                    | \$178 886,379 40                                                                                                                                                         | Lotal                                                                                                                                                                                                                                      | \$178 596 379 4                                                                                                               |

Policies in force January 1, 1919 1,360,433

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"Gentlemen Adventurers of England, Trading into Huddon a Say!"—such was the title con ferred by Charles II upon the Company of Couragnous Men Sviola 1670 set sail over dangerous seas for the hand that is now Canada.

For almost 314 contures the Hudson a Bay Company has endured—the largest mercantile enterprise of Greater Canada.

unserprise of tereage Carbada.

This Company shows haulage. It has grappled with transportation problems that indieded every natural difficulty. Whole cargoes of hers for England had to be carried across the pathiese ponts. Mail and supplies for the lonesones trading posts made return jonds heavy. Mountain walled it is forests fought its program show blimarch blocked and dasheartened it distance believed with mountain the control of the

With pack horse and ouse, with dog sindge and conce, is freed its way steady oursed? Forty slow miles was often the leng day a progress but the Geatlemen Advantures—"pet Sars. Today is a coluer story. Transportation is swift and powerful. The Hudson's Say Company—gifted through telals and triumphs with a been thorough knowledge of haules methods and problems—carefully and possible total senses with the contract of the contract

# THE OLDEST BUSINESS in America now chooses FEDERAL Trucks

The Hudson's Bay Company has had more than two hundred years of active experience in transportation.

Its judgment of modern motor transports amounts to moral certainty.

Its deliberate selection of Federal Trucks confirms a fact that thousands of other discerning business institutions have recognized.

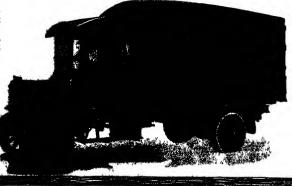
Federal Trucks of proved serviceability, fulfill every requirement of modern motor haulage

'Federal Traffic News"— a publication on modern motor haulage and its application to business will be sent free on request to responsible executives

Federal Motor Truck Company, Detroit, Mich.

# FEDERAL

One to Five Tons Capacities



viii On

To Bridge Same



In the hour of peril when French motor car factories was agaded in war work, France, the place of the modern motor car to America for help to supply great army staff with means a sale transportation. France what she wanted—reliability ance, speed and ease of riding.

We consider it a signal house in this crucial time the French eramental motor experts danse.
Marmon 34 as the American suited to their needs.

Every Marmon owner may well consider this a tribute to his the same NORDYKE & MARNAT

COMPANY

mbilded 1891 : INDIAMARCKI

# SCIENTIFIC AMERICAN



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rice 10 Cents \$5 00 a Year

## WHAT MAKES *VALUE* in A MOTOR TRUCK

A TRUCK yields so much performance for so much money—price plus operating cost. What it can do, how long it can do it, how dependably, at what cost, alone determine its value, into which enter five factors to be carefully considered by every purchaser. These are:

#### Record and Performance

WHAT a truck can do is measured by what it has done, in work accomplished and length of survice Where comparative cost records are properly kept, single unit White instillations grow into fleets In mixed fleets, White equipment is uniformly selected for the hardest task.

#### The Maker

VFRY truck needs a sponsor, a maker E whose name is a guarantee of honest, efficient manufacture whose policies and resources assure that he will be here to stand back of his product permanently The importance of this is apparent when you consider how few makers survive in any line of manufacture

The White Company is financially sound It has been building highest quality motor vehicles for eighteen years, and holds a manufacturing position second to none.

#### The Factory

THF White factory is one of the largest equipped that a very large volume of out- expertly installed and permanently proput is obtained per unit of labor. Thus the \_tected.

purchaser receives value fully commensurate with his investment

#### Truck Experience

THE White Company sells not merely 1 trucks It sells efficient transportation It knows how to install the kind and size of equipment for a given task can adjust the truck installation to keep step with the business It has knowledge gained by years of experience with many thousands of trucks in all lines of trade-an asset of the greatest importance to the purchaser.

#### Service Facilities

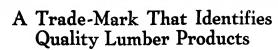
TO get maximum earnings out of a truck. I it must be kept going, and this can be assured only by resourceful and convenient service to the owner

The White Company has covered the country with facilities for quick and complete service-plants, spare parts and field organization It required years to build up No new manufacturer can do this; no small manufacturer can afford it.

The purchaser of White Trucks secures I in the industry and is so modernly motor transportation at the lowest cost,



THE WHITE COMPANY. CLEVELAND



THE IONG-BELL LUMBER COMPANY has a well established reputation for the uniform high quality of its lumber products. As evidence of that fact, in the short time of twenty-five years the number of our saw mills has increased from one to thirteen and we have become the largest manufacturers of Southern Pine in the United States. Vast virgin forests, complete, modern mills, milling methods which are unsurpussed and the infinite care given to every detail of our business make this trade mark—

## Iong-Rell

THE MARK ON QUALITY LUMBER

That mark is now branded on our lumber products it identifies quality

IONG-REIL Air Seasoned, Creosored long leaf South ern Pine Poles one of our well known products are decay proof. They will give satisfactory service for upwards of 50 years for the IONG-REIL hydraulic pressure-vacuum process of creosoting thoroughly impregnates the entire sap w od **ipne-Rell** Creosoted Southern Pine Poles possess great strength resist ordinary crass and brush fires and are straight and attractive They are branded on one end with the I B mark

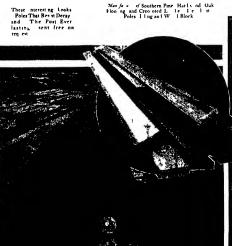
Officials responsible for continuous efficiency will find that **Ione Bell**. Cre soted Poles assure good service in I will prove the assund investment

Γο be su e of quality ask your dealer for lumber products bearing the **long-Rett** trade mark

## The Iong-Bell Lumber Company

R A LONG BLDG

KANSAS CITY MO





## PACKARD PRICE INSURANCE

In fairness and justice to all purchasers of Packard transportation units, whether Packard Trucks or the famous Twin Six Passenger Cars, we wish to make plain our position regarding prices for the coming year



HE Packard policy is nothing short of absolute insurance of your investment at present price quotations

If at any period during 1919, by reason of lower costs of material and labor or for any other reason this Company finds it possible to make a price reduction, this reduction will not only be made but made retroactive and we will refund to every previous 1919 purchaser the full amount of the difference between the price he paid and the new

If, on the other hand, production costs should increase and a higher price become necessary, the present purchaser has the advantage of his investment as the new price will apply only to those whose orders are received after the change is announced.

As we stated some weeks ago, Packard prices are carefully and accurately based on the cost of material and labor There was no artificial inflation during the war and costs have not decreased since we last manufactured for private consumption, consequently there is no leeway for a price reduction now

If a reduction becomes possible, every present buyer sees his investment protected and insured.

This policy, while unique in the automobile world today, is consistent with Packard policy in the past, and seems to us the most fair and straightforward way of meeting present conditions.

Were we to give a guarantee that present prices would be maintained, it would mean a one-sided bargain in favor of the manufacturer, as it would prevent us giving the buyer a reduction, should material and labor costs justify a reduction.

The Packard Company makes a greater percentage of all the parts that enter into its car than is made by any other fine automobile concern in America. It does this because it cannot buy and assemble parts that are up to the Packard standard of service and quality.

Skilled labor of necessity enters very largely into the production of so beautiful, so simple and so proficient a mechanism.

The net result is that the upkeep of a Packard Twin Six is less than that of compromise cars at half or two-thirds the Packard price.

To the man who can afford the first cost, a Packard delivers utility value for every dollar of his investment, greater economy, less depreciation and it does not ask him or his family to compromise in the service, the comfort, the safety of their motoring.

From present indications there will not be enough of either Packard cars or trucks to meet the demand this year.

Trucks are ready for immediate delivery. Your order for a Packard Twin Six passenger car of say model should be registered with your Packard dealer at once to insure late spring delivery.

"Ask the Man Who Owns One"

## PACKARD MOTOR CAR COMPANY, Detroit

Transportation Specialists—for freight or passenger service by high road or air route—Trucks, Passenger Care and Airplanes

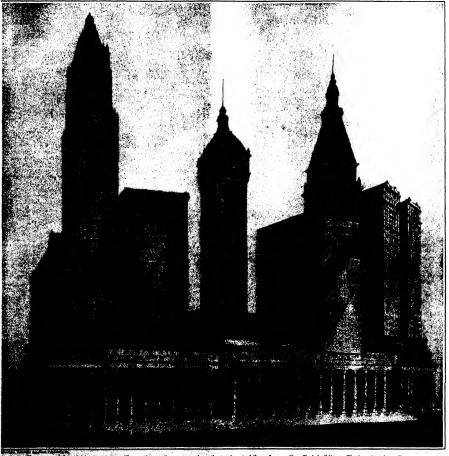
# SCIENTIFIC AMERICAN

## THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

OLUME CXX.

NEW YORK, MARCH 1, 1919

10 CENTS A COPY \$5.00 A YEAR



The present Agent movel gragues will seet statues times as much as the total cost of those famous New York buildings. Woolworth, Adams Express, Singer, Molespellan Lills, Jageistales, and the Pennsylvania Station [See page 204]

## SCIENTIFIC AMERICAN

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#### New York, Saturday, March 1, 1919 Munn & Co 233 Breadway New York

Charles Allan Munn President Ore D Munn Treasurer
Allan C H ffr Sar tary all 1 ald lir niway

lucidly the latest events of the cit of with the latest events of the day. As a welly 3 well it is in a person to announce enteresting developments before they are published elsewhere.

The Edit is glad to hive submitted to him timely articles suitable for these clums especially when such articles are accompanied by ph tog sphs

#### Derelict Mines A Peace Peril

N1 of the regulations of the Hague Convention directs that all innes and tornedoes shall be so adjusted that they can never become a per manent menace to navigation. Torpedoes must carry an automatic device of such a character that if th torpedo misses the mark the firing mechanism will become inoperative and mines must be so constructed that if they break loose from their moorings and float to the surface their firing incchamsm will cease to oper These obligations form part of a series of rules and regulations which are designed to protect non combatant ships both during war time and in the neace that follows a war. Phone is abundant evidence that the enemy failed to live up to these humane stipulations -a fact which is continually being brought to public attention by the loss of merchant ships through contact with mines in almost every quarter of the navigable sear

One of the strpulations of the armistics called for the ill disclosure by Germany of the plans charts etc showing the location and extent of the areas which she had mined during the war and in the intervening months since the armistice allied mine swepers have been engaged in removing those obstructions. In view off the disorganization of their navy during the latter part of the war: it is doubtful if the German Admiralty accurately charted this mined arise and this mines be particularly time of the work done by the German submarine men-planters which probably bad a roving commission to drop their eggs wherever the individual commander had opnortunity for undisturbed operation.

But even if the German admiralty has accurate charts of its own mine fields the complete removal of these would not mean that the seas have been rid of this deadly peril Swift currents and heavy seas frequently cause the mines to break adrift from their moorings and when this hannens out him to her omes a floating menage which is more deadly to payingtion than any water logged lumber schooner or other derelict of the sea. The alhed navies followed strictly the rules of the Hague Convention and when allied mines broke adrift or torpedoes went astray they became or were designed to become The ruthless methods of sea warfare fol apop jonal lowed by the enemy included a total neglect of this precaution with the result that heaven alone knows how many mines are floating on the surface of the sea that require only a touch from a passing ship to detonate them

I or these reasons we think that for some time to come shipping should continue to use the profestive measures which proved so effective during the war particularly when they are passing through waters such as those lying off our own coast and those of I urope where the enemy mine-layers were most active during the war. Many merchant skippers are alive to the danger and are acting the captain of a freight ship informs us accordingly that, once clear of the harbor entrance of an American port, he throws overboard his paravanes and does not take them in until he is well out to sea and that, on approaching his Luropean port of destination he makes a nort of dropping them over loard sesso. How long the peril will continue cannot even be conjectured but it will be remembered that over a year after the close of the Russo-Japanese war, a merchant ship was sunk in the eastern waters of the Paonic by a mine which had broken adrift during or subsequently to the naval oper ations of the war. For a long time to come it will be the duty of the watch to keep a sharp lookout for this deadly north of the sea.

#### The Hudson River Tunnel

It is doubtful if there is a problem of transportation anywhere in the Unsted Stat a which calls for a speedy solution no loudly as that which concerns the city and port of New York. To say that present facilities both for passongers and freight are inadequate to to state a fact which is perfectly well-known to every New Yorker from railway president down to the humblest strap-hanger

It is as true as it is paradoxical that the very topographical features which make New York one of the finest ports in the world, at the same time reader it one of the most difficult to operate for although the Hudson River is a magniteent fairway for shipping its breadth of 3 000 feet has proved a sectious obstack to the working out of a well coordinated and co-minuted system for the distribution of passengers and frught and particularly of the latter.

Not only as Manhattan the very heart of financial, commercial theater-going and pitasure-seeking New York but the indications are that it will ever remain such and the problem of the distribution of freight and passenger traffic will always dy 1s1 upon the question of overcoming the great natural obstacle which separates Manhattan from the mainland

Twenty to twenty-five years ag, it was believed that the solution lay in the construction of one or more bridges across the great river but just on the eve of the active construction of a bridge the divelopment of iterror traction reached a stage which made it possible to operate passenger trains beneath the Hudson River without fear of killing off the traviters with that most deadly posson earbon monoxide gas. Thereupon we saw the construction of the two Praneylvans tubes and the four tubes of the Hudson tunad system all electric ally operated.

But let it be carefully moted that the eigenering world refused to commit itself to the construction of these tubes until the electric lecomotive was forthcoming for it was well understood that any system of traction which involved the combustion of fuel and the expulsion into the tunnel of the poisonous products of combustion was ruled out of the case on the ground of human health and safety. It is needless to say that electric tries too through those tunnels has been a great success and that there has been no difficulty in maintaining the purity of the air

It is now proposed to build a great double-deck tunnel beneath the Hudson and use it for motor truck and automobile traffic This would be an altogether commendable enterprise if its promoters were possessed of reliable data based on actual working conditions which showed that it was possible to allow a closely spaced stream of automobile and motor truck traffic to proceed continuously through a tunnel several thousand feet in but no such data exist | I he danger of asphyxia tion of passengers, truck drivers chauffeurs etc, arises from the fact that perfect combustion can never be obtained in the cylinders of a motor and that there is consequently a certain percentage of that deadly poison, on monoxide, exhausted into the air \_hxperiments made by Clerk showed that this poison is present in a ratio ranging from 2 4 to 6 9 per cent of the total volume of the exhaust of a motor ear, and the Royal Automobile Club in a test of 12 cars, obtained four results below two per cent and eight above that figure, while other observers report as high as 15 per cent of carbon monoxide

The peri of this possess here in the fact that it is colories and codretes and stateletes, and that except by chemical analysis, its presence than be detected only by the symptoms of possessioning in the pattern. The sponsors of the tunnel believe that fit can be properly ventilated by artificial means, but one of our most expert authorities on visitation has estimated that to ventilate the 5,500 feet of tunnel between the man shafts would call for a 12 000 horse-power plant—that is to say to keep the procuratego of earbon monoused down to the point of safety would require such a rapid continuous replacement of the air, that a ventilating system of that great horse-power would be necessary to do this work with a proper factor of safety.

Therefore, we urgs upon the authorites the nessessity of making, in the interests of public safety, a most thorough examination of this question of ventilation before the necessary sanotions for operation are given. The tunnel should be built, but with the understanding that it shall be used only for electric and horse-drain traffic, for such in the growth of Greater New York and Jersey Chty that any and every means of rail and vehicular transportation between Manhattan Izland and the manland will be used to its full capacity, almost from the very day on which it is put in service

#### The Doubtful Factors in the Problem of Transatiantic Flight

HAT a flight across the Atlantic Ocean will be made in the immediate future as almost certain. It is, in fact, altogether remarkable that solisted before now I'll to one that solisted before now I'll to other histories and the solisted before histories and the solisted before histories are solisted before the Atlantic S. however, quite another matter. It would be unsafe to predict how soon, and under what conditions, this will be realised.

The monumental report of the Civil Aerial Transport Committee, recently published in England, embodies some discordant ideas on this interesting question Few persons have given more study to the problem of transatlantic flight than Commander Porte, whose preparations to undertake such a journey in the summe of 1914 were terminated by the outbreak of the war This authority, as quoted in the report just mentioned, believes that the direct route botween Ireland and Newfoundland is at present out of the question, and that for many years to come the only practicable route will be by way of the Asores Commander Porte also considers Newfoundland an unfavorable terminus for the westward journey on account of the obstacle opposed to a safe landing by the notorious fogs of that region He prefers a landing ground on Long Island, though its distance from San Miguel (Asores) is about 2,250 nautical miles, as compared with 1,346 miles from San Miguel to Newfoundland

The elements of uncertainty in transatiantic flying are almost wholly meteorological. The proposed Asores route offers the advantage of the trade winds for the westward journey. Whether and to what extent, the counter-trades which blow above the trades and in the opposite direction could be utilized for the return journey to burrope is still doubtiful, because we lack precase information about these winds, particularly as the hiele of the whole of the precase information about these winds, particularly as the hiele of t

That the coasts of Newfoundland are habitually shroaded in fog seems to be taken for granted in all speculations about Atlante flight. The Britain report, however, roatsins two communications from authoritative sources which emphatically descredit this idea for the Newfoundland coast for years, declare that long prevails there only with winds from a quarter between north there only with winds from a quarter between north was an experiment of the prevailing winds are from west and northwest. He has given a whole season from west and northwest. He has given a whole season from west and northwest. He has given a whole season from the 
The moral of all this seems to be that a metocological and strological arrey of the North Atlantic Osans and the adjacent ceasts should be undernaken as soon as possible, with special reference to the needs of seronautics. That ar lance scengeritis Atlantic are destronable to become of great concount injunctages heardy admits of sjouth. The study of surface "injungation and adjacent and the second 
#### Blactricity

Autometic Fire Extinguishers for Transformers. -In conjunction with the Salakotten Works for explosion-proof containers, the firm of Stemens & Halake of Germany has developed an automatic fire-extinguishing equipment for use with trasformer or oil-switch ars A thermally sensitive device in the chamber to be protested closes a relay circuit when the temperature in the chamber exceeds a predetermined limit The effect of this is that a tank of sulfuric acid is emptied into a potamum carbonate solution and the CO- formed is carried by a pipe line to the chamber where fire has The chamber is filled quickly with the gas and the fire is stifled At the same time one or more alarm bells are rung, the ventilating chimhey in the roof and the oil outlet in the floor of the chamber are closed, and valves in the CO<sub>2</sub> pipes leading to the chamber affected are opened Description of an actual metaliation is given with dimensions of the apparatus in a recent useue of Science Abstracts

Underground Wireless - Speaking recently of his work for the Navy, Prof James R Rogers the inventor of a wireless system for underground and submarine transmission, stated "Six or seven years ago I began experiments with the transmission of electric impulses by the ground They were renewed during the war with the audion bulb which renders the receiving apparatus more sensitive I first established contact with nearby points and before long received with perfect distinctness impulses sent from Europe I placed my antennae in trenches radiating from a center and pointing by the compass toward the distant station from which I wished to receive I demonstrated to the Navy Department that eight operators may receive at once from eight separate wires My system was installed at New Orleans the Great Lakes station and Belmar N Y and is now used at the principal wireless stations in the United States I have found the best results with my wires buried six feet below the surface in damp ground Some of my experiments were conducted in water 25 to 50 feet deep

Radio Telegraphy in the British Air Service .-The new air service for passengers mails and parcels delivery will begin, it is stated in the United Lingdom and the continent of Europe Every airplane will be upplied with a combined wireless and telegraph installation and an efficient operator adopting the same system as is in force with regard to ships. As every airplane will doubtless have either a name or a distinguishing number it will be possible to send telegrams from any part of the world, or from any ship on the sea to the airplane It is intended continues The Florirician that this organisation will be ready by the time peace is aigned and the relaxation of restrictions will allow the free flight of airplanes. Arrangements have recently been made for the erection of wireless stations in the extreme parts of China one on the frontiers of Cashmere and the other on the Chinese side of Siberia For this purpose machinery will have to be conveyed right across China and transport by air will have to be arranged for there is neither railway nor road The Marconi Company has arranged with Mr Handley Page for the transport by one or more of his big machines

A Standard in Radiotherapeutics - The problem of a suitable standard of quantity for use in radiotherapeutios has received much attention and cannot be said to have been completely solved. Most of the devices have been based on the application, as the units of a certain fraction of the energy required to produce inflammation or redness of the skin but this is naturally s somewhat indefinite measure as is shown by the fact that the ratio most commonly employed originally one-third, is now taken as one-fifth Mr Bordier in a cent communication to the Académie des Sciences proposes as an alternative a method depending on changes dissociation, and has devised a chromoradiometer,' providing five chief scales (based on colorataon) which will suffice for all clinical cases, according to The unit is defined as the quantity The Electroson of X-rays espable of liberating 0.1 milligramme of iodina in a sable centimater of a two per cent chloro-formic solution of sodoform of a thickness of 1 cm, and placed in the shadow of the radiation. This unit, it is contended, depends on precise physical processes, which is not the case in the methods previously man-

#### Science

Stenches as Danger Signals in Mines —The U S Bureau of Mines announces that it has developed a novel method for giving a danger warning in mines particularly metal mines, in which compressed air is used throughout the workings An Ill smelling substance is injected into the compressed air line and within a few minutes the odor is apread throughout the subject. A technical paper is to be published on this subject

The Mineral Resources of Spitsbergen —A cording to a note in Nature, the accessible coalfield of Spitsbergen are estimated to have a content of at least 4000,000 000 tons of good steam coal and this region is destined to become one of the thir coal-producing countries of Europe About 100 000 tons of coal were shipped from Spitsbergen to Vaudindavana countries last year. Promising samples of iron ore have been received from this archipedage, other inneral resources of which include gypsium in enormous quantities abbestos copper ore, all shale and probabily free oil.

Fighting Mosquitoes with Bats in the Philippines—The Idea of fighting mosquitoes and incidentally providing a source of guano by the erection of bat roots figured videly is the press are may or seven years ago in connection with an undertaking of this sort in Texas I is indervating to learn that this idea has now been taken up in the Philippines where the Bureau of Senece is encouraging the building of hai roots as an aid to the destruction of morquitoes. The Bureau has drawn up plans and spot instations for this dotted which it distributes to any one who will erect a

A sumptuous Work on Phesants is William Beebes Monograph of the Phesants in flour volumes the first of which has recently been judished in I indiand under the auspices of the New Yir k', logical Society In order to collect material fir this work the author with the aid of funds supplied by 'ol A R Kuner of Barnardwille N J spent I' monograp had in constitute Ama and the East Indies and also vest( I a number of museums in Lurope The monograph will constitute by far the most important so are of information on the subject with which it deals I it is cyrously and beautifully illustrated but—a four volume is antific work that sells for \$250 a na anomaly that ought to be corrected!

The Study of Industrial Fatigue as carned on in British munition factores during the war led to results of great interest to both employees and employees. We are glad to bearen that the British are; in we gue to extend these investigations to industrial cut il inhimonts generally and have accordingly setablished in Industrial Research Board uni'r the Dipartment of Scientific and Industrial Research Committee. The duti's of the heard as reported in Naires, will be it ministe organize and promote, by research, grants or offer yes investigations in different industries with the vice is finding the most favorable hours of labors, spelle if work rest juames etc. The chairman of the board is 1'rd (8 Sterrington and headquarters have been catablished at 15 Great George 81, Westmuster, S. W. 1 I ondon

New Experiment Stations of the Bureau of Mines Of three experiment stations lately established by the U S Bureau of Mines, one has been located at Bartlescilla. Okla and will devote its attenti p to the petrol um industry. The town of Bartlewille through its chan ber of commerce, donated the site and provided \$50 '00 for the erection of buildings and it is expected that he state of Oklahoma will provide funds for corperat re investigations A second station which will be devo d to studies relating to caranics has been locate, at Columbus, Ohio which is the center of important slay industries The University of Olio provided quarters and is furnishing half the necessary funds for the support of the station. The third new station situated at Minnespolis, will investigate problems relating to the iron and steel industry. The first year has been devoted to the question of increasing the supply of manganese available for making steel, in view of the scrious shortage of this substance Eventually the Minneapolis station will take up the important question of beneficiating the low-grade iron ores upon which the iron industry will be obliged to depend when the rich ores now available in the Lake Superior ragion and elsewhere are exhausted.

#### Astronomy

More Nova In the Andromeda Nebula—Two more now were found in the Andromeda nebula on a photographic plates taken last October with the 80-inch reflector of the Mount Wilson observatory making as total of 11 thus far discovered within the limits of the nebula. Neather of these two any pears on plates taken in August which probably res it is stars of the 18th photographic magnitude.

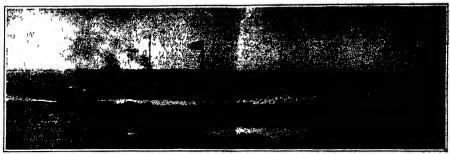
A New Observatory in Arizona —In consequence of a gift of 860 000 from the latt Mrs H S Steward of Tueson as a memoral to he rivalend a new astronomical observatory is about to be creeted on the campus of the University of Arizona at 1 tueson The principal felescope a 37-inch reflector was ordered some time ago, but work on it has been delayed by the war. The observatory will be under the direction of Prof A E Dourlass

Interstellar Media and the Colors of Stars—Mr. Harlow Shapley in his recent studies on the tolors and magnitudes in stellar clusters states that the similarity in the frequency of colors for near and distanct clusters shows that the selective scattering of light in space if string uniformly affects the color induces of stars by less than two-millionths of a magnitude for each parses of distance. With any reasonable assumption as to the dependence of light scattering on stellar concentration, interstellar media appear unimportant in their effect on the colors of stars brighter than the fifteenth magnitude of the start of t

Size of Planetary Nebulse Measurements of the parallaxes of nebulæ are beset by obvious difficulties and comparatively few satisfactory measurements have The most recent investigation in this field been made that of Adriaan van Maanen of the Mount Wilson observatory who has measured the parallaxes of six planetary nebula with the 60-inch reflector of that observatory I rom the parallaxes it is possible to de duce the size of these objects | the largest of those measured (N G ( 6720) has a diameter of 10 000 astronomical units the smallest (N & C 7662) a diameter of 1 350 astronomical units (major axes in both cases) The diameter of the orbit of Neptune - : the diameter of our known solar system-is only 60 astronomical units

Meteorology of the Solar Eclipse of June 8th, 1918—An analysu by Meser kunisal and larguason of the data obtained at 55 Westher Burran stations lying within the rose of 90 per text obscirration of the sun during last nummer a total eclipse, shows that in general the fall of temperature was compartively small owing parhaps to the cloudy settle that prevailed along the path of the cloudy settle that prevailed along the path of textle years of the cloudy settle prevailed and the path of textle years of the path of t

The Problem of Solar Rotation is reviewed in a recent paper by ( St John in which he assembles the large body of data thus far obtained by means of spectroscopic measurements as to the linear velo ity of solar rotation at the equator The data obtained by several observers extend over a period of 21 years and the values range from 1 86 to 2 08 kilometers per second Measurements of the speed of the sun s rotation are complicated by the fact that the sun is not a solid body and its rotation varies with latitude also as shown by studies at Mt Wilson with altitude to different rates of rotation are found at different levels in the solar atmosphere I saily local convectional currents in the sun a atmosphere though they may have little effect on average values make it lifticult to discover possible short period variations in the speed of rotation. Hu brecht has found evidence that there is a difference in rotation between the northern and southern hemis-It is very dourable to have an extended series of determinations made by the same observer and at the same time to keep the instrumental conditions unchanged Such a program has been under way at Mt Wilson for five years and it is hoped to continue it through a whole sunspot evele



New type of submarine 340 feet in length doing 24 knots under steam Note the three 4-inch gana, two forward and one aft; also the two amekestacks, which feld down when the submarine submerges. Displacement submerged 3,700 tons, agond 10 knots

## The Submarine Situation

The Submarine with 12-inch Gun a Fact-and Some Other Facts By C. H. Claudy, Special Correspondent of the SCIENTIFIC AMERICAN in London

PRYING submarine facts out of the British Ad-DIVING submanns facts out of the British Administry is something like prying an argument in favor of naval drinking out of frend Damele—it can be done to the thought of the done the diving out of frend Damele—it can be done to the thought of the daministry people, but they first find out if you play risk it (Laglash for being on the level 1) and then they bind you to secrecy. You must it tell 1 ho chainstay doesn't want submarines to much talked about And if you sak them why you get something like this 1 he peace conference has just being in Young how the tit will be deceded that thereafter there are to be no such things as submarines. It is possible that it will be deceded that thereafter there are to be no such things as submarines. If it is deceded that the ubmarine has too many indecent possibilities—as was decided long ago in the case of poissoning will and the use of poissoned bullets or mushroom bullets—then there would be no objection to telling very one everything we know about submarines. But if sub-verything we know about submarines Is aft justice. everything we know about submarines But if marines are to continue to be a naval weapon we don t want to give away all the things we have learned And

want to gave away all the things we have learned. And formany has by no means any monopoly on submarine formany has by no means any monopoly on submarine After you hear anything like that, of course, you just larly inth to take some of these submarine people and shake them by the besis in the hope that some sub-marine facts will drop out. Indeed, a few have dropped out my way which I can ropest but I have the feeling that there is a for more behind which they won it till

For instance the use the British navy made of submarines during the war. They haven't said much about it but the British submarine seems to have played a rather large part in anti-German-sub work. It so a rather large part in anti-German-sub work. It seems that it was a very large factor in convoy work and that one of the reasons why we managed to land a couple of million men in France was because Britash subs were constantly on the job. A collection of them—number would be deleted by the censor if I knew it and put is m-would need all the convoys as they approached the German submarine sone and accompany the troop ships and destroyers in This fast was carefully allowed to come to German's notice. The result was that German submarines immediately became very

much more cautious than they wanted to be A German submarno could lie on the surface waiting for the approach of a convoy known to be due and sight it, from its low position in the water, long before it could be sighted. It would then be comparatively easy to submerge keep the convoy in range and choose ship and time for a torped shot But if the German automarna. time for a torpedo shot. But if the (serman submariae commander felt that every natant he was on the surface he was under possible observation from a Britain submarine persone and that he, in turn might memericanly oxpect a torpedo to arrive and make torpedom that oxpect a torpedo to arrive and make torpedom that oxpect is torpedo and the submariae torpedom the submariae torpedom the submariae torpedom the submariae to the subm through periscopes

through peracopes
A peracope sounds very nautreal and optical and
devilish. Actually it is a way medicent substitute for
clear vanos. And while the immunity of conveys
of troughtips coming from Americe may be necessarily
of troughtips coming from Americe may be necessarily
samoles screens airchips, careful plans, what you will,
there is a kine any sum to on the face of the British submarine authority which says that in his belief at least,
the strong moral effect of the presence of British submarines secompanying all convoys in, had a lot if not
most to do with it! most to do with it!

British submarines were largely used in patrol work in the North Sea where also their moral effect was felt Doubtless they laid mines and doubtless, too, they made German mine-laying submarines have a more difficult time than would otherwise be the case. Laying a mine van a submarine sounds very easy but as a matter of fact it isn t. A mine-laying submarine—there is a German mine-laying submarine now lying as an object of ex-hibition off Westminster Bridge—has a series of wells forward which hold there nuises each. The mines are released by pulling a lever inside, one lever for each are released by pulling a sever inside, one sever for each mine. The mines are prevaranced with anchors and cables of the proper length and they must be laid, therefore all in a certain prearranged and specified place, otherwise they will be too deep for effect or so close to the surface that they may be seen. To find a specified area from the deek of a ship, in fine weather, and with no onemy about, is one thing To find the same area by dead reckoning, in bed weather, from a submarines, which is dodging belloons, airplanes, destroyers and other submarines, is something else sgain! And there appears small doubt that Fritz had it by no means all his own way even with his very efficient exploit-year-laying small doubt that Fritz had it by no means all his own way even with his very efficient explosive-seg-laying undersea boat It is reported, for instance, that over 12,000 Bruta muses were ladd from March to November by one fittills in one locality (Helupoland Bight) and while by no means the work only of submarines, sub-marines were an indisponsible part of the work. Bir Ero Geddee has said that "as the German sary would not Ero Gedoce has said that," as the Uerman navy would not come out in force, our submanue and mine-lying bosts, had, day after day and night after night, entered huge German mine fields of Heligicand and blocked the channels through which some German boats left and returned These trap mines dat to over one hundred German eraft being eaught during the first six months of 1010 "

1918" There seems to be a general impression abroad in the world that Germany had almost a monopoly on such marine devange, and that the rest of the world stood by in annearment of humbly followed in the master's footness, and the provided with the matter's footness of the world stood to the matter's footness of the world of the matter's footness of the world of the matter of the world of the world of the world of the matter of the information that the of them at least volunteered the information that the plans for many a German submarine had been seen and examined before ever there was one captured of the same type—which would seem to induste, if truth that Germany had no monopoly of secret service effic-

iency! However that may be, it is certain that while sub-marines do not carry paravance for avoiding mines in fields.—for the paravance is too slaborated and com-plicated a device for a submarine, the efficiency of which consists largely in its ability to rise, "look—see" and dive-



A real super-submarine, mounting a 12-inch, 50-ton gen, and built for bombarding the forts at the Barchardine Streits. The British and this weeks is included by

pile, an afficiency which would be largely interfered file by any such additions to its bow-while they de not carry paravanes they do have some method of avoiding mines I wish I could tell you what it is swelding mines I wish try out and your what it is, to the hear all sorts of runner. One hear of a wonderful shedried device which "unliftes" the potency of mone prought within range of the "unliftying" ware. One sake the Admirally authorities about it, and they doubt one's sanity—and small blane! But some sort of a mine avoiding ability British submarines must possess the submarines which were the work they undoubtedly did do in locating the outrance and the suit to the mine protected areas from which German submarines were wont to come and go.

Bagiand started with some 86 authorized, built about its good to be a submarine with the submarines were wont to come and go.

Bagiand started with some 86 authorized, built about its good to be a submarine such as the submarine see that the submarine see that the submarine see she never had known before O course she explured some German of the money that the output of the submount before O course she explured some German of the submount before O course she explured some German of the submount before O course she explured some German of the submount before O course she explured some German of the submount before O course she explured some German of the submount before O course she explured some German of the submount before the submount before O course she explured some German of the submount before O course she explured some German of the submount before the su

the learned how to build submarines as has never hed known before Of course she captured some German submarines as has never hed known before Of course she captured some German unbursaines and doubtless took some ideas from her senemy, but she developed some ideas of her own which has a 1700-ton submarines carrying a 12-lach gun. No build to the Dandandeleo operations and while he was completed too late for that purpose she was a technical success. Ble fives, of course, only force and aft, the gun having a traverse of perhaps six degrees and only an accessed be fives, of course, only force and aft, the gun having a traverse of perhaps six degrees and only an accessed be 6500-pound shell a maximum of 15,000 pressors. The first course is course of the second of the course of th

brazzions and copperiess all her valve wheels a

metal or from.

Another fact which stoke out like a sore thumb is that she was evidently built to be lost, not to last. There has been no such thing as accessibility connidered in her fittings. For notance, the ventilating fanche capitals called my attention to its hum, and said that, of course, they could stop and start it. But they couldn't booke it statedly and that if it broke down and had to be regarded it would apparently be a dry-dock to the capital of the start of the capital of the capit had to be repaired it would apparently be a dry-dock job. Nothing in her has been planned with the idea of job. Nothing in her has been planned with the idea of the planned with the helicity of the planned with together with the helicity of the planned of destroyed together with the helicity of the planned of the an overhaul she would be captured or destroyed Her engines, two six-oylunder 300-horse-power at 500 revolutions per minute heavy oil engines, were, according to the young British commander, models of their kind, sweet-running and efficient Her two

me, one used from the conning tower and one from the control station just aft the mine laying com-partment, are beautiful examples of Carl Zeus, Jena optical work But they possess no focusing device for eye-accommodation which would make them most inde-

eently difficult to use if strictly normal She car-five officers—and she had for eight of the crew and place to eat, save the rest, save the bunks, no bunks! Room simply bunks 1 Room simply
—indeed, the pussle is
placed themselves Of
crowding is due to pracforward of the conning mine wells, storage

ones eyes were not ried a crew of 40 and siceping accommodations two officers! There is no two officers! I nere bunks, no place to place to hve, saye the doesn t exast on her where the 40 men course much of the tically all the space tower being devoted room and galley but



Bow view giving end-on view of 12-inch gun, which has 6 degrees traverse

even with all that room available for living quarters the U C 95 is a mighty crowded vessell

It was interesting to learn that mon small physically re preferred in submarine work, not so much because by take up less room than larger men but because of the fact that a submarine sailor or officer must wear a great may olothes to keep werm and a big man can't put on enough and still have room to pack swiftly through the hatches! The tempersaires of a submarine in winter it seems, rarely rises above \$0. If the capitae are running the hatches must be open to supply air and the amount used is enough to make a veritable cyclone come down the hatches are Result, insterior temperature is always low If submerged, and no air moving through the book, the temperature is kept low by the temperature of the water outside and the fact that the enginee a source of heat, are not running! Consequently every one piles on sweaters and leather costs and workin underwear and the fact that a submarine sailor or officer must wear a

fur gloves until the diameter of the hatchway limits further protection!

There is a wide divergence of opinion to be heard regarding the disposition of the surrendered submarine Admiralty officers not connected with the submarine service generally think the submarine should be abolished and the surrendered boats sunk or distributed to various nations simply as exhibits and currosities of course they will tell you  $\sigma r f$  flows can play the game and dd play it—uc to principle and ended in oper boats with defence-merchantmen and shelled no oper boats with defencemerchantmen and shelled 110 opt: boats with delicace-less women and children nor stood by and In ighed while enemy crews drowned! But other people apparently, can't And if they can't then the submarine ought to be abolished and all those in curtence sunk

os sonismer and all toose in extreme sunk.

This point of view natural amough in a nation which hates Germany under the sea as she never will hate her on land, wont hold water with a parallel argument. No naval authority wants to abolish seaplanes yet air planes were used to homb hospitals and murder defence less women and children in church home and school of the property of the planes women and children in church home and school of the planes women and children in church home and school or the planes women and children in church home and school or the planes women and children in church home and school or the planes women and children in church home and school or the planes women and children in church home and school or the planes. The submanne-service man, of course, points to the work his branch has done during the war and his absolutely clean record, and asks why a perfectly good weapon must be abolished from the world's navies because a blackguard, a man who doesn't play cricket a beast with no understanding of the dictates of humanity in warfare happened to misuse that same weapon? se knows what the Peace Conference may decide and it may very well avoid a possible source of discord by agreeing to destroy all the captured submarines rather than try to distribute them—but it seems a frightful waste of good material

#### Electric Welding in British Ship Construction

ALARGE British electric company has issued a pamblet on the application of its system of electric welding to ship construction. This is the system that was employed in the first revetless ship the launching of which was snounced in July last and it has also been approved by Lloyd s for use instead of riveting in vessels intended for classification in their Register Book

For the last two years the company has been investigat-

ing the problem involved from two aspects—on the one hand testing the relative strength of welding in various types of joints and under all conditions of stress, and the other determining the modifications of d necessary or desirable with welding Some of the results obtained under both these heads are given in the pamphlit and are held to show that a suitably designed joint welded by this process, is not merely as strong as a riveted joint, but is in fact substantially stronger and that the various modifications in design evolved by the company overcome many difficulties encountered in the

tompany overcome many entrements a usual methods of ship construction

It is pointed out that a mere tensile or bending test is not a sufficient criterion of the strength and suitability of a welded joint and two joints welded by different processes may give approximately equal tensile results, but show a marked difference when subjected to alternating stresses. Thus on tensile test there may be little to ing sursees. Intus on tensite test three may be intule to choose between two joints, one made by a skilful widder using a bare wire or ordinary slag-covered electrode and the other by means of are electrodes but on an alternating torsion test the latter, it is stated may be expected to stand at least 200,000 alternations while the former will usually full at less than half that number



ing, showing perimope, and

Living and berthing quarters on the same submarine. Note folding borthmaker table and washetand

## Influenza—The Sphinx of Diseases

By Wade W. Oliver, M.D., Professor of Bacteriology, The Long Island College Hospital, Brooklyn

WHEN we speak of the cause of a disease we are WIEDA we spork of the cause of a miscose we are guity of an error. Any given disease has many causes for purposes of convenience and exacting the causes of a disease in divided into two classes (1) the exciting cause and (2 contributing causes. The contributing causes of influents in tide such factors as overerowding universality of travel promocuous coughing and specing of individuals suffering from the disease etc. The exciting cause of influence or the particular germ responsible for sitting up the infection is not known.

It is a curious and sugg stive is t that in regard to exact knowledge of the exciting cause of a number of our Care knowing of the extension of a minute in our most common decases we rat aim as as worfully in the dark as was Hipportates the littler of Medicine! The list of desages of disultid or unknown causation includes such continu maladas as small pox mumps who ping cough mosts scarlif fever and influents Leaving out of consideration for the moment the

recent world wide condema of influence whose toll of death so sardonically abetti d the ravages of war (in this country alone estimates place the number of deaths from influenza during the past three months at from one quarter of a million to three hundred thousand) we find that there are few adments which are responsible for so general a physical mental and conomic impairment as are common colds. Universal attention has been attracted to this initially because of its apparent recent outbreak in epidemic and pandemic form erroneously terrind Spanish influenza Confusion has been worse confounded by loose statements in both the lay and included press that Spanish influenza is really bulbonic plague or what is commonly spoken of as the In the rapidity of its spread in its high mortality and in certain of its manifestations in the body the disease has somewhat simulated in certain respects the pulmanary form of plague that dread scourge of the tropics. But just as one or even sveral swallows do not make a summer so do certain similarities fail to

in 1892 Dr R Pfeiffer of Berlin, described a germ

which he believed to be the cause of influence and, in honor of his discovery, the micro-organism has come to be known as 'Pfeiffer's Bacilles It is a tiny rod, one of the smallest known disease producing bacteria, averaging from 0.5 micros 1.5 micross in length and 0.3 micros in the bacter 1.5 micross in length and 0.3 micros in the bacter 1.5 micross in the bac micron in thickness (1 micron - approximately 1/25000 of an meh In 31 cases suffering from epidemic influence, he found this germ in the sputum coughed up from the lower air passages. Independently and in the same year Canon claimed to have found the same germ in the blood of influence patients.

discovered by him was the exciting cause of influenza upon the following grounds (1) The influenza bacillus was found in the pus-laden sput me coughed up from the lower air passages (bronchi) in all uncomplicated cases of influence (2) He elaimed to have found this gern only in cases of influence (3) He found the baoili corresponded with the course of the disease and that when the purulent (pus-containing) secretion from the bronchi ceased, the micro-organisms disappeared (4) He claimed to have simulated in essential details, the disease in rabbite and apes by injecting into the veins of these animals a pure culture of living influenza bacilli

suspended in counton
Wetchealbaum (1892), Huber (1893) Kruss (1894),
Richter (1894) Baumler (1894) Borthardt (1894) rather
quickly confirmed Pfeiffers work as regards the presence
of the influents bacillus in the sputim of patients sufforming from epidemic influense findings which have been
reported by many competent besteriologuis since that reported by many competent baseteriologate since that time. The second and thrid of Pisifiers contentions, vir that the bacillers is found only in cases of influences and that when the secretions case the bacill disappear have been somewhat discredited by the work of subse-quent investigators. In the bronchial secretions of persons convalescent from the disease, the bacillus of Pisifier and infrequently persons for long persons of time Pisifier and infrequently persons for long persons of time that the pisifier is the pisifier of the pisifier of the natividuals for years. His fourth contention is that in rabbits he pixtravenous must tou of nairs callure of H. in rabbits by intravenous injection of pure culture of B

influenza, influenza-like symptoms were set up, is not generally agreed to by more modern bacteriologusts, nor is his statement that by rubbing a pure culture of the bacillus within the nose of monkeys he was able to set up influenza-like symptoms in these animals

When to this is added the fact that, even as early as

When to this is added the fact that, oven as early as a 1892, sputs were reported from uniforms patients, during the source of rather widespread outbreaks of influences in Europe following the great pandemic of 1890-82, in which persentent search failed to show the presence of Pfeiffer a bealfulus although other germs, such as the streptococcus, were found almost if not quite as constantly in the sputno of influences patients, grow which had as much or as intie scientific license for being constantly and the sputno of influences and the had because of the access of the failure and the scientific described the search of the failure and the scientific described the search of the failure and the scientific described the search of the failure and the scientific described the search of the failure and the scientific described the search of the failure and the scientific described the search of the failure and the scientific described the search of the scientific described the scientific described the search of the scientific described had as much or as little scientific litems for being con-sidered the cause of the disseas as did the bacillus cham-pioned by Feiffer, we are given a curously pertinest insight into the not infrequent orthodoxy of science. Truly, we, in whose eyes science has almost the stature of a god, must wake a little more humbly within 'that frill and ill-saured edifice of knowledge wherein we dwall. Until the past year, the Findie houlius has occupied an almost unssaniable position in the halls of Bacterology. and only now is the conception that this germ is the true cause of influenza being shaken from its high sitar

Fuel for the fires of scopticism is added in the form of such experiments as those referred to in an editorial in the such apperments as those referred to u an editoral in the issue of the Sicientific Assets as of February 1st, very recently performed by the United States Public Health Service and the United States Navy (Some Interesting Though Unsure-seaful Attempts to Transmit Influensa Experimentally, Pub Health Rep. 34 33, Jan 10th, 1919) In the series of tests made at Boston, 68 men from the naval detention camp at Deer Island were inoculated with pure cultures of the influensa bacillus, with servetions from the nove and throats of patients in the carry stages of misensa and with the blood of the control of th as were both filtered and unfiltered secretions from the

(Continued on page 212)

## Industrial Coöperation as a Factor in Reconstruction

By Frank B. Gilbreth, Mem. Amer. Soc. Mech. Engineers and L. M. Gilbreth, Ph. D.

Till war is over This fact has been known and realized in France and Ingland for several months In America it is not as yet fully realized. The next thing is to return to business

In returning to business we must remember that the first step is to get down to secretific methods to discover install and maintain methods that insure permanent progress. Many programs have been suggested as hest said as positively essential Secretary I are has said that whatever our yews we must realize that the era of the sovereign workman has come. The president if a gre it manufacturing association has stated prisident of a great manufacturing association has stated that its mixings and cipplying segurating must realize that I aget hours and lower pay must be the order of things it this country cann incit diorege competition. The advocates of a high protective tenff and the between in free fault have presented their distributions of the problems confirming, our nation of the problems confirming, our nation that offers that of the problems confirmed as the solution of the problems confirming, our nation. the effect that regardless of conditions prior to the war, during the war it was for labor's interest to make as large individual outpats as passible

I aghsh labor unions now insist that a Shop Committee

of workmen shall have a voice in avery installation of new methods in management

In all these recommendations one feature stands out elearly namely that there must be a recognition of the mutual advantages of hearty cooperation between enquiver and employees and the disastrous effect of atrikes and lack outs on employers and employers and on the public

It has often been thought that the interests of em ployers and employees are and always will be directly opposed but there are many intelligent investigators who maint un that these reterests are not opposed as as generally behaved

The purpose of this paper is to bring to the attention of the workers managers and employers a basis of action for the beginning of a systematic cooperation that will be of greatest importance not only for their welfare but also

for the welfare and prosperity of our entire nation.

The great problem of obtaining cooperation can obviously be divided into subsidiary problems, and we onn select such of these as embody identical interests of all

Let us list some of these sub-divisions on which there no question of conflict of interests and examine them with the idea of fostering special cooperation on these subjects and thus make a start in founding habits of intensive

general cooperation in management and worker Such a list of non-entagonistic sub-divisions of manage

ment would look something like the following

- Acadent prevention
- Patigue surveys and the elimination of unnecessary fatigue
- Cobperative stores
- Regulation of temperature and ventilation Maintenance of hygienic conditions beginning with education on the subject of danger of spitting on
- the floors
- Oral hygiene I get ald rooms for the sick or injured

- I rist aid rooms for the sick or injured Shower baths and lockers for clothes Cafeterias, lunch rooms and casinos Playgrounds and flower gardens Annual plents and shutdowns for vacations Cooperation with public libraries
- - Bicycle rucks and garages
  - Reduction of labor turnover Mutual aid and sick benefit associations
- Laboratories for research in best meth There is nothing new about any of these 17 subjects. They can be seen individually in operation in many

plants great and small, and some organisations have them all working in greater or less degree. The great work skready done in secident prevention is well known. The number and extent of injuries from secretaria in many organisations have been reduced to but a small fraction of previous records. The descrip-

tions of the methods that can be adopted for reducing accidents are obtainable by any one by examining the reports and transactions of the National Safety Council I here are cases on record where organizations have reduced accidents over 80 per cent by accident prevention education. Livery accident affects the injured most but the employer and public are also affected by the loss of output and productivity involved in each accident

Fatigue surveys with the elimination of unnecessary fatigue opens a field for national waste elimination that is fatgue opens a field for national waste elimination that is colosed in extent. There is probibly no field that offers such opportunities for savings in discomfort, for increases in output and for prodouging years of productivity as does fetigue study. The important work of Prof Q F Blessing of Swarthmer College should be known to every manager and shop committee as outlining a practical method of arousing interest in fatigue. The recent discovery that 51 Li per cent of our seldies have been insifted with their shoes (from 71 per cent to 71 20 per cent to omail and 98 tper cent with alone of the production of the prod

to any also actual tupury to one spidless. Many organizations are shread yecognizing the first Monday in Discember oscil, year as fastgue simination of the shread yecognizing the first Monday in Discember oscil, year as fastgue simination day, and are making special efforts for codeperation on this subject with their workers, and it is hoped that the practice will become more universal as years go Europe Cooperative stores are much more common in Europe Cooperative stores are much more common in Europe than in this country, but there are many successful cases that can also be quied here. The unual practices in for employer to furnish the space and for a committee of workmen to operate the store. This results in large of workmen to operate the store. This results in large The regulation of is unpeature and ventilation far too often is swarphody's business, hence subdoy's business. Many times those sitting by the window ubject to (Continued on page 212)

## Correspondence

The editors are not responsible for statements made in the correspondence column Asonymous commu aleations cannot be considered, but the names of correspondents will be withheld when so desired

#### Synthetic Investigation of Organization

To the Editor of the SCIENTIFIC AMERICAN

The magnifect conduct of our men in the trenches has been paralleled for two years at least by matchless does at home To this employment records of all was industries beet testimony. From the railroad president dollars-year man to minuters and lawyers working their many than the conductive and lawyers working their parallel of the conductive testing testing the conductive testing the conductive testing the conductive testing testing testing testing testing testing testing the conductive testing t time and overtime as laborers and riveters, the American

workingman, newly composite has fought a noble fight On the other hand, the very opposite is also the case and the monstrous overhead the creation of thousands of high salaried positions for disproportionate brains the opportunity to graft more easily than ever grafting could be done before, has resulted in strange confusion

be done before, has resulted in strange confusion.

Before the war, even System had become a forgotten
cult replaced by Efficiency rampant. The highest aim
of a corporation was to so functionise its personnel that
human beings might be blue-printed like machines. A
stenographer who could not 'take four bundred a
minute was below par, a machine operator whose
arm motions were slightly under rount, was undesirable.

Tests of all kinds controlled. Men of a certain type,
happin, sationality, were accepted for certain or cuprations
and all others rejected. Schools sprang up overywhere
the controlled to the controlled of the controlled to t

Just as one saw the missined product of an obtain a given time from the disappearance of raw cotton into the comber so any man or woman could enter school and emerge after some months qualified for high salary as an efficiency or welfare worker

In the case of cotton it is either dirt or cotton that goes through the comber In the case of the human being no two elements were alike Yet they were boing no two elements were alike Yet they were swallowed in the husk by Industry, and efficiency was still the dominant word. No one realized that the most shining examples of efficiency occurred where Clenus as the Head had been able to support the industrial structure with selected departmental genius

structure with selected departmental gamus. When the war was started efficiency was morthan ever the word and we all know how spluddly it served as a basis to start from, and how little it could be adhered to in the event. If we had not had the idea of building fabricated ships, shipbuilding right have been paralysed, and yet the fabricated ship has played not very glorous part in the war. If German efficiency had not convinced us that the super-training of men was aboutly not have our present allement. necessary, we should not have our present splendid military organisation. But super-trained troops did not bear off all the laurels at the Marne

So it was with our factories. In spite of enormous numbers of efficiency men, in spite of inspectors some-times, as in a recent case at the ratio of one inspector to four workers, in spite of speed and need for speed the amount of rejected material was astounding, the overhead alarming

There is a flaw somewhere May we not say that it is in efficiency not in its aims but in its ruthless methods? In its homogeneous adherence to forms and in its insti-tutional training of men and women?

tutional training of men and women?

We find on our records people of the leasure class of all ages who performed sustained manual labors at record speed month in and month out, side by side with skilled labor that turned floater and lost its earning capacity. No longer can be demanded exclusive types of men. I would not baltitle the true Efficiency, the deare to receive which has turned American wide-awakeness and exterprise to such crunent accompliatment, but I do say that this availables cannot be maintained by machanism.

that this excellence cannot be maintained by mechanical

methods—by settled forms

Let us then reorganise under a new name, both qualitative and quantitative, and call ourselves Synthetic

Investigation.

Sympathetic, it might almost as well be for the quality of sympathety, intuition, call it what you will, as the quality that puts the right man in the right place that shows the Capshals of Industry where to locate, where to find his market, how to build his credit and above all what use to make of the brains of his associates. The Synderic Investigates too, must be endowed with this quality above and beyond all training. He must be added to live that life of the factory he arrange allows as considering as be breathest the as: It is must be shown to the the state of the state of the contraction of the state of the stat

elements that go to make union or disunion duplications, interferences, inflation or over concentration lack of cooperation and above all missis. He must save his forms for the last, to be the uniform made properly and to order, for an organization deserving the tion

To do this he must know much of human nature and be able to see more aids than one. His special mental equipment is worth all the training in the world and his place is in the employment service

This most vital spot in the management of any productive concern, I believe that for such work women are particularly adapted. So far when women have worked in employment, it has been in the hiring of women or in keeping records under the supervision of men or as in one notable instance as the inspirational estimator of men a ability. That should not be the

Welfare that other much abused word represented westere that other much sousce word represented by exponents as often well-trained so often as cold and patterned as chilly squares of lineium in sace should sleing to employment. Food Lodging and Care should belong to employment. Amust ment Preliminary Hir-ing and Pinal Buchargo, being the great media through which may be determined the unspoken forces of an industry also belong to Employment

But the means at hand, however pleutiful is lost if the investigator is the product of education solely and devoid of the knowledge of human nature which is the distunt necessity in the chaice of personnel upon which all business ultimately depends It gaves that touch of scultment to organisation without which in some form

I know of no really successful individual or corporation Instead of laying stress on our profits from production e should beast of increased localty and contentment a saving due to a minimum turn over This I enture of a saving due to a minimum turn over This I enture to predict will be the better item of the two in dollars and cents and certainly far more economical and credit

It is plain that many large employers now feel this The time has come when I flict ney must join hands with Entrusted to conscientious exponents trained and inspirational, industrial organization will be care fully examined and the pride of the expert will be not in how many factories he has squeezed into the mold of his forms and system, but in the successful resource fulness and adaptability of which his system is the

GENEVIEVE W MARON New York City

## A Definite Plan for Physical Reconstruction in the Devastated Areas

To the Editor of the SCIESTIFIC AMERICAN We all know that parts of France have leen destroyed by the invader, perhaps we are n t all clear as to the extent to which the destruction has here carried. We may therefore revert to M. Tardieu s address of Novem-8th last in New York, where he stated that in the devastated area 350,000 homes have been demohshed. 90 per cent of France s spinning and weaving industry put out of action 83 per cent of her hig iron production out off 70 per cent of her sited production sent off roll per cent of her sited production similarly affected an equal proportion of her sugar industry destroyed. In this region, which formerly paid onedestroyed In this region, which formerly paid one-quarter of the taxes collected by the 1 rench Government everything has been carried away or destroyed literally nothing is left. All this must be rebuilt. How? We have lost two and one-half million men. A

fitteenth part of our people is missing at a time when we need all our material and moral forces to build up our But beside this restoration we understand rapidity of execution is a primary condition of the reconstruction of France and that the United States by its immense possibilities of production must be our first. be our first aid

In brief there is nothing in the way of building materials adulpment, domestic utenuls industrial machinery that is not needed in very large quantities

and at once The Construction Division of the United States Army has here in America 30 million dollars worth of building materials that have never been used. When to this is added all the material of like nature from the other added all the material of like nature from the other departments here and in Finner, when to this is added what can be salvaged from the demolstion of army plants and civil plants that muss be abandoned the figures become staggering. The Construction Drusson alone construction and the contraction Drusson alone pound loaves of breast jet ed. Out of one group of temporary offices buildings alone there will soon be available 12,800 plants, 23,000 good office deaks, as many typewriters, sleetled fans and other equipment in prepartion. And so it goes on all addes Intractories are being prepared showing materials on band. It will take some time to complete these Mean-

while it is safe to say that the component which was used safeguard morally and spiritually 4 000 000 men as no body of men were ever cared for before will go a long way toward the qui k reconstruction of communities aggregating 350 000 houses at least until such time when a new generation may without suffering and want provide for itself more in a crdin e with its own

Moreover the Construction Division of the Instead States Army one of the most off the regarizations of the sort that ever was get together as still intact It still possesses its construction equipment with the operation of which it is familiar. Its labor is connect tion with the conduct of war is alm at huished within a few months it will have been distanded. To allow it thus to disintegrate while this great construction demand exists would be an economic crime. The majority of these men would be willing to get a leaner of they could continue their present organization and be permitted to work by the methods that they have made so success to work by the methods that they have made so success ful. At the invitation of the Irench Engineering Societies and the Irench Government a representative body of American engineers is now in Paris conferring with the French regarding municipance and construction of all kinds for the devastated areas delegation returns to this country and advises as to the exact state of affairs we should be ready to take instant

action

In a word let all building material and other equipment owned by the Unitel States Government hoth
here and in France and purchased for war purposes be nere and in I rance and purchased for war purposes of collected. I has will include inaterial not yet used as well as that salvaged from the demolition of war plants Let all such inaterial as can be used in the reconstruction of I rance he turned over for that purpose and delivery expedited to the utmost of our ability Let the Construction Division of our Army or such part of it as can profitably be so employed go to France to cooperate in the utilization of this material. I inally let all this be considered as a part of the cost of the war to be included in the bill against Germany

the destruction. The principle

Germany has done this destruction. The principle of reparation is accepted. But reparation by cash payment is notoriously inadequate and direct reparation is slow and uncertain. We however are in the ideal position to bring about speedy and effective reconstruc-tion while slowness of payment provided ultimate payment he properly secured is of not the least con sequence to us. And eash payment when thus made to 

JOHN V SCHARFER

#### Another "Original" Toothless Saw To the Edit of the SCIENTIFIC AMERICAN

Here is an earlier date for a toothk ss buzz saw thau any I have seen mentioned in your paper. When I was a young boy (born in 1838) I lived from 1845 to 1851 eleven miles northeast of this city. One day I walked two miles to see a wood turning machine shop owned by John Joslyn who turned handles posts rounds etc various kinds of pioneer furniture and implements He took great interest in showing inc the various inschines and lastly attached to the lathe shaft a toothless disk six inches in diameter which he had cut out of a plate of common sheet ir in Giving the disk a very rapid motion he cut through a large steel file several times a stream of and out through a large sect in several times a stream sparks fluing 20 inches or more away. I know this was previous to 1851 because my family movel from that vicinity in March of that vicar and as it was warm weather whom I visited the shop it could not have been weakurt whom I visited the sholp it could not have been later than the summer of 1850 and proi lably not carber than the summer of 1849. If lave these dates before me in my father a antobugraphy. I think the idea of that particular saw was original with Mr. Ioslyn.

I have been a continuous subscriber to the SCIENTIFIC AMERICAN for forty five or six years and consider it is the most instructive journal published and expect to take it as long as I liv

Coldwater, Mich

Chicago Ill

#### That Big Navy

Io the Editor of the SCIENTIFIC AMERICAN We want to congratulate you on your editorial with reference to the foolishness of building a great navy

we are in thorough accord with your ideas—and we like your publication have always been strong believer, in a big navy However, it seems utterly foolish now and we are mighty glad that you handled the subject

E R ARMSTRONG

Chicago

## Airplanes for the Transatlantic Flight

What Aircraft Constructors Are Doing Toward Making the Great Flight Possible

I it were merely a matter of providing a suitable If it were merely a matter of providing a suitable machine the transattains flight wild by now be a fast accompt. For it is a well known fact that Great Britain Germany and the Intel States and perlaps France and Italy as well have so trad surplants now available for the or issuing if the the usands of miles of ocean. Other fact its hay of derived winters from maken. ing the attempt although many signs point to the suc-cessful accomplishment of the feat within the next few months

Among the transatilatic airplane possibilities is the scapiane of tapt Hugo bundstell a Swedish aviator now in America will his more or less completed his preparations for the great trip bundstedt a machine at present writing is riding on waters of Newark Bay, off the southern and of Bayonne N J As yet the machine has in tecesived its final tests preparatory to the first leg of the transatiantic journey which is from Bayonne N J to some point on the Newfoundland

The mount designed and built especially for Capt The mount designed and built especially for Capit Mondat dit as hiplan of huge proportions resting on two long postocous. It has xxx.pitonally graceful lime as compared to the squitty appearance of similar sured machines of the fiving boat type. The upper plane, has a spread of 100 feet while the lower plane measures 11½ feet. Between the wings and well in front of them is the state of the same state of the fiving the proposed of the state of the same state of the fine five first proposed. Back of the cabin stretches the fuselage or framework terminating in a simple (penage or tail. The cabin is provided with four a its upholstered in artificial leather—two for the two pills and two for the two mechani-—two for the two pill has and two for the two mech humans who are b! make the trip. All the controls are installed in diplicate so that if one set should be constanged on other is available. Maps and meteorological data are plated in front of the pilots together with compasses and other instruments. One other saids of the cahm is a save-plated listle-Sott organe rated at 220 horse-power and enclosed in a stroum-line canning the engines delivering a both of the power of 440 horse power driver two propellers. I he

total lifting area of the acapiane is given as 1 537 square feet. The weight is 10 000 pounds. The estimated speed is 80 miles an hour

speed is 80 miles an inour Capt Syndrodisch is 80 miles an inour Capt Syndrodisch is no aviator of long experience. In July 1914 he made an airplane flight from Bue in Irane to 8 tooksholm in "weeden or a matter of 1.200 miles without landing. The time for this trip was 13 hours and 20 minutes and considering the comparative crudeness of privair machines this was no mean achieve-However at as well to call attention to the seem ingly low horse-power of Capt Sundstedt's seaplane Most machines of equivalent sire are equipped with two togenes of the I therty or Rolls-Royce type delivering some 800 or 900 horse-power as compared with his 440 horse-power. It is true that the (aptain has made certain important improvements such as cutting down his head resistance to a minimum and cutting down the weight all round I or metance his pontcontaining 32 compartments are made of the lightest wood and weigh surprisingly little. But the fact remains even if the machine is of the seaplane type as



Capt. Sundstodt's seaplane in Newark Bay, during trials

contrasted with the somewhat heavier and more cumber -boat type, that his power plant is considersome lying-boost type, that his power plant is considerably loss than what is generally accepted as necessary for such used craft. This would seem to mean them while Capt Sunsted's mentione should be capable of flying and flying well, it is not capable of meeting adversed conditions, such as storney counter words, which are almost certain to be met on such a lengthy flight Iurthermore such a mankler fully loaded could hardly, if at all iffy with a single took r which means that during the entire passage the two engines must furnitum particularly.



Cabin of the Sundstedt scaplane which contains four seets and dual controls

In a word, Capt Sundstedt's machine, given ideal flying conditions and the very best of good fortune, ought to be able to make the transatiants journey. But in no wise does it appear capable and ready to confront adverse winds, rough seas—should it have to alight for repairs and adjustments and then take off again and other deterrent factors. Planky, it does not anticipate such disadvantages. There is no factor of safety or should we call it factor of hard tuck?

Aside from the Sundstedt machine, the United States

has another entry in the transstantic flight in the form of our Naval machines. On February 5th, the Navy of our Naval machines. On February 5th, the Navy of the property of the development of plane and assembly of the development of plane and assembly for the attempt the Navy has several machines available, especially the hope block of the type-host type, known as the N C 1, which was described and fliurisated in these pages come time ago. The N C 1, which has with three Liberty waspess or about 1,200 horse-power unit of the control of the type of the

more than sufficient for the transsitantic flight. The trum-engined flying beats of the Navy, which were also described in these columns, are available in large number. These planes, equipped with two Liberty segmes, each furnishing about 400 horse-power, could be made to carry suffuent fuel for 16 or 29 hours flight if the transsitants flight were made in two or three jumps, so to speak, with mother ships along the route to furnash fuel and other supplies as well as anable erews to make repairs and slight deplements, these F-5 type planes could readily make the journey. But if a non-stop state of the suffer of

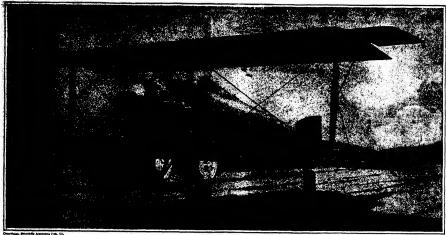
made public

made public
Turning to Europe, we find our Braisis cousins working hard to get an arpiase started on the transatiantic
journey A number of machines are already available,
and are receiving their finishing touches and "funding" to be followed by extensive trial flights One machine
for the coming context is the Porte "Super-Baby" triplane flying boat, designed and buils for Liest Porte,
who will be remombered as the young Bratish navis offices
who was to attempt the flight in 1914, but where plane
were interrupted by the war. Liest Porte's present
mount has a span of 122 feet, a fuelage length of 60
feet, a height of 27 feet 6 inches, and a total weight of
28,400 pounds. The two woren rianes are of the same iest, a neight of 2' lest o incises, and a total weight of 25,000 pounds. The two upper planes are of the same span while the lower one is somewhat shorter. The column included in the flying-host member. One commendable feature of the Porte plane is that it me quipped with five Rolle-Reyce motors of shout 250

it is equipped with new Rolls-Reyres motors or show say horse-power such, arranged in two tandem sets and one single "pusher" So it in evident that Lieut Porte means to take no chances with sugine failure be has discounted the darkest kind of misfecture by having at least two angines to the good, that is to any, by having two engines more than he needs for plain liying



Two views of the Sundaindt sentions designed and



Oppose a model according to the ascriai commuter. It starts and alights on an ordinary road. It makes a speed of over 100 miles an hour. And it costs no more than \$2,000!

## Every Man's Airplane — A Big Step Toward Aerial Transportation

The cover illustration of this issue is based on solld fact. It is not an artist vision of the future, but a drawing of what can be done and what is likely to be done arrived to the future, and the scale of the future processes of the community within the realm of immediate realization for all persons who have hereinfore been able to afford a motor car.

The machine is a single-seater biplane, designed by of long experience in sirplane design and Captain James V. Martin, who will be realized see a man operation. In reality, the machine was designed originally as an allitude fighten, provision being made for oxygen tasks and electrically-hated dothing; but with the termination of hostilities Capt. Sartin has turned over the biplane to pescoful pursuits with very few structured changes. tural changes.

entirely of three-ply timber. The system of wing bracing also is unusual, as is the arrangement of the under carriage which makes it possible for the wheels and the (Continued on page 216)

## How Passengers Are Taking the Place of Bombs in Airplanes

THREE months ago it was a question of building planes which would carry a large cargo of bombs to the distant cities in Germany. Today, the same machines are being converted for passenger carrying, and the question is offs of carrying the most passen-

gers as rapidly as possible so as to compete with the more procaic means of transportation. The accompanying illustrations are of immediate

The accompanying illustrations are of immediate interest in that they show how two well-known types of bombing planes have been converted into passenger-sarying planes. The machine with the cabin body is the big Farman biplane now being employed in Paris-England service. The machine has a span of 92 feet, named to be a span of 92 feet, and the property of 92 feet in 10 can climb 1,000 feet in four minutes, 3,000 feet in 10 can climb 1,000 feet in 10 can properly of 10 can be seen to 10 can be

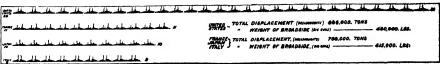
A dosen passengers can be carried if they do not object to crowding.

The other machine is a converted Caudron twin-engined bomber, also equipped with what appear to be radial engines of the Salmson design in both wingplanes. In the case of the Caudron, however, the In the case of the Caudron, however, the In the case of the Caudron, nowever, one fusedage is arranged with a huge cockpit so as to hold the passengers without other protection. The Caudron appears to have a wing spread about the same as the Far-

of what is being done with the Handley-Pages, Capronis, Gothas, Lizenz bombers, and others in Europe.



to bestile the sel Superit it the fight The sell-one



( umparative standing in dreadneughts built and building of the navies of the United States, France, Japan and Italy

## Cost of the New Three-Year Naval Program

Moving Up from Millions to Billions in Naval Estimates

feeling uncasy over the fact that the productous scale upon which naval and military appropriations have been upon which have and ministry appropriations need to wool during with times his upset the sine of values among our present giver in it officials. Nowhere has this change been min in reked than in the Navy Department for whereas in the years preceding the war the conservative estimates of mayal necessities by the General Bour I were received with positive dismay by naval ecretaries and denounced as extravagant and militaristic by naval committees both of the House and the Senate today when the war is over, appropriations infinitely greater than those that were asked when the German

menace was lifting its throatening head over the eastern horizon are bitthely presented by the 'ceretary of the Navy and enthusiastically endorsed by him, not only in afficial reports and in hearings before com-mittees but in public utterances upon the platform and in the press
One of the most commendable

pledges with which the present govern pledges with which the present govern ment entered upon its high duties and undertook its solemi national obligations was that of a careful con-servation of the public moneys and of an economy which should strike a reasonable mean between wild ex-travagance and a parsimony which would be fraught with national peril Surely if there is ever a time in the anairs of a nation when there is a tail for strict economy it is at the close of a war of the first magnitude and in the presence of the enormous debts that such a war inevitably leaves upon the shoulders of the people. The citizens of this country who have made such a noble response to the call of their government for a curtailment of their personal expenditures so that they might make a generous response to the government call for money feel that they have a right to look for a quick scaling

down of government expenditure now that the war is over Hence, they have viewed with dumbfounded amazement the call of the Navy Department for the construction of a new flext whose cost will be equal to that of the whole of the existing flext which we have built up during the past quarter of a century.

It is a very simple thing to ask Congress to authorize a three year program it is not so casy for the mind to grasp what an enormous sum of money must be expended. not merely to build the ships of that program but to maintain them year after year. It is the purpose of the present article to translate these millions and billions of

dollars into concrete every day terms, which will bring home to the average Ameri can a sense of what such oxpenditures actually mean

During the discussion of the proposed new three year program before the Com-mittee on Naval Affairs of the House of Representatives Secretary Daniels presented an estimate of the cost of maintaining a may of the This estimate was drawn up by Admiral 8 McGowan aymester General of the extraordinary materest, be-cause is gives not only the cost of building the proposed three-year program, but also three-year program,

fleet previous to 1916

flect pr vious to 1918. We find from this statement that the original cost of the flect, evaluate of the three-year program authorised by act of August 29th, 1916, was 3773 000 000. The estimated cost of the three-year program act of August 29th 1916, as 7671,000,000. and the estimated cost of the proposed three-year program as originally proposed was given by Admiral McGoroma as 891,000,000. It must never be forgotten that providing the money to build show as meany to be the control of the proposed three-year program as originally proposed.

build slaps is merely the beginning and not the end of the expense. The ships must be maintained and the maintainent of a fleet is an enormously costly thing. To

Eleven eighteen-foot transcontinental highways of concrete could be built for the cost

quote from Admiral McGowan's estimate if the 1916 three-year program and the second three-year program be completed the annual cost of maintaining our en-larged navy will be about \$700 125 000 per annum for yessels in full commission, in reserve commission, and

In 1913 when the threat of war existed and the menace of German ambitions was well-understood in overy government of the old and new words the annual cost of maintaining our navy was \$138 000 000 Today, when that threat has disappeared with Germany navally impotent for a generation to come and with every great naval power our close friend and ally, Mr Daniels is

program of 1916 and the original cost of the existing fact privous to 1918. We find from this statement that the original cost of the flow, exclusive of the three-year program authorised by act of August 29th, 1918, was 377 5000 on The stimated cost of the three-year program act of August 19th 1918, as 781,000,000. The stimated cost of the three-year program act of August 19th 1918, as 781,000,000 and the estimated cost of the proposed three-year program as originally proposed three-year program as originally proposed three-year program as a 581,000,000. the Pennsylvania Kaliroka 1 eriminal (\$1.5,00,000), the Adams Express Building (\$8,000,000) and the Metro-politan Life Building (\$8,000,000). Thice monumental structures, known all over the world for their size and cost, total altogether in value \$46,050,000. A vast sum, truly, and yet we are asked to spend

for our new navy over 16 times that sum of money

So much for the monetary and of the no mucu for the monetary said of the problem as affecting the national treasury. Let us now bring it down to the more intimate relation of the pocketbook of Smith, Jones and Robinson The cost of maintaining pocketbook of Smith, Jones and Kobinson The cost of maintaining the navy of 1913 was 85 90 per family per year. The cost of building the new navy, as represented by the two lives year per section of the present of the cost of building the new navy, as represented by the two lives year of the present of the total cost as given above, but it is certain that, if the present of the control of the present of the total cost as given above, but it is certain that, if the

advocates of an enormous hat, of the advocates of an enormous hat, of the advocates of an enormous hat, of the advocates of an enormous hat have their way, these battle-crusers will figure in the bull as finally put through. The bill, as passed by the House, calls for the ultimate expenditure of \$750,000,000 It, on the Scientific Aspects believes, the oxpenditure will be absolutely unnecessary, let us consider what could be usefully done with this lung sum of money Nothing promotes the prospenty of a country so greatly as efficient means of transportation. We need a system of good roads throughout the United States. Now a fifered-mass lifetoc encorate order can be built for an average.

of good roads throughout the United States Now as instructions in Proc. conserver one can be built for an average cost, including both easy and difficult country, of \$30,000 per him. Divide this \$30,000 me to prespective cost of this second three-year program, and you will be the present administration processes to be willing to apsaud on an unascessary addition to our navy, would build fire the production of the contract of the process of the contract of th try from Canada to the Mexican border and the

> Why does the SCHENTIFIC AMBRICAN consider this second three-year program to be quite unnocessity? For an answer we direct at-tention to the diagram at the top of the page 13 shows, in allhouste, the number of divariations by the United possessed by the United



Cost to each family in the United States of the preposed big nave

naval powers, France, Japan, and Italy, when our 1916 three-year program and their own existing programs have been completed. At that time the United States will possess 29 dreadnoughts, most of the them the biggest ships of their kind affect. France will have 11 dres

France will have 13 dread-noughts, Japan 10, and Italy 9 That is to say we shall have 99 dreadnoughts as against 30 for the next three powers But our 29 dreadnoughts will have a total displacement of 886,000 tons as against 788,000 tons for the three combined fleets of our allies, moreover, our total broadside for the fleet will be much greater, namely 460,000 pounds against \$15,000 pounds

The SCIENTIFIC AMERICAN has always been a big-I'm SCIENTIFIC AMERICAN ans siways been a Dig-navy 'lournal; we stand for a big navy today, and we believe that the construction we now have in hand will give us, as shown in this diagram, a navy amply sufficient to show the fing and protect our interests in all the seven seas

#### Handling Coccanut Oil in Bulk

NEW methods of handling coccanut oil at Pacific N are new in successful operation Previous to the war, the bulk of the oil was shapped to Europe, but with the closing of European ports great quantities came to the United States 1t is estimated that we will reselve soonants oil to the value of \$80,000,000 during

the year 1919
Until recently the oil was shipped from the Far East in cases and barrels. The excessive cost and great waste o this led to the attempt to ship in bulk. The problem was a difficult one because of the fact that the oll solidifies at 70 degrees Fahrenheit. Experiments in provious was a uniquest une poscusse of the fact that the oil solidises at 70 degrees Fabrenheit Experiments in running heating tubes through the tanks of vessels, storage houses and care have now reached such a stage of practicability that bulk shipment of occount oil is penised as having arrived

This enables tankers which have taken cargoes of Into enables tankers waten nave taken cargoes or refined or jubratung oils to Asiatic ports to load to espacity with socoanut oil for delivery into bulk storage on our Paosine coast, and subsequent distribution in tank cars. One of the first companies to enter the field has set up a storage plant in San Francisco, with a complete set up a storage plant in sea "Faceline", with a comprese equipment for getting the oil out of the steamer into storage, and out of storage into the tank care Six-inch pipe lines lead from the storage tanks to the piers and to

pipe lines lead from the storager couplings are made with fearble steel hose When the coccanut oil is pumped into the steamer's hold in the Orient it is of the consistency of heavy fuel oil. The scheme is not to minima in in this state oil The scheme is not to maintain it in this state throughout the voyage, but to let it freeze up as solid as it pleases while the vessel is an route. It is marely mosesary to have the oil at pumping consistency on arrival, so steam is turned into the heating tubes while the ship is a day or two out of San Franceson. In the same way, the oil is allowed to solidity in the storage tanks and again in the tank care, and steam turned into the heating tubes of these units only whon it becomes necessary to reduce the oil to flowing consistency. In this way a great deal of steam is saved, in fact, it is this allow that makes the first the commenced of 
alone that makes the process a feasible one commercially at the storage plant the oil is never purposely permitted to remain in the storage high like ledding from vessel have been empited, steam or compressed sar is introduced into the outer end of the pipe line behind the oil, and all of the latter remaining in the line is forced into the storage tasks. Nevertheless, there is danger that the oil will become hardened in the

pipe line and obstruct the latter wholly or partly So a one-inch heating tube is carried down the center of the six-inch pipe, returning on the outside of that pipe to the boiler room. By turning steam into rouit any oil that may remain in the six-inch line is soon melted out. The lines that are used in filling the tank cars are similarly equipped with a heating core, hers, however, after filling a car the oil as permitted to remain in the filling line, to be melted out when the next car rolls

into place.

The oil gramps on board the vessel and at the storage plant must be equipped with a steem jacket, as else provision must be made for the certain draining of all oil from the pump immediately respectively. il oil from the punny man processing in a punny mention cases. Oil allowed to remain in a punny-bat has no steam jacket would now wildly; and then a pressure of 100 pounds of steam would not suffice to clear the tubes.

| _ |                 |                                                            |
|---|-----------------|------------------------------------------------------------|
| Ī | 775,000,000.0   | GOST OF FLEET UP TO 19/4                                   |
|   | 1,674,000,000,0 | COST OF IDIE PROGRAM AND PROPOSED BECOND SYEAR PROGRAM     |
| ı | 138,000,000.9   | COST OF MAINTAINING NAVY IN 1913 - 6 YEARS AGO             |
| ŀ | 702/25,000,W    | COST OF MAINTAINING NEW MAYY INCLUDING TWO 3 YEAR PROGRAMS |

This shows how the Secretary proposes to increase the cost of the Nav

### The Labyrinth of Chemistry

WHY is it that most chemical manufactur is inv stead of turning out several grades of the same product, as seems the rule in most fields produce several compounds of radically different nature, and but ne grade of each? Why, in the lists of war contraband assued by the English and French Admiralties do we find such stems as fallow and other? Why was it in sable after more than two years earnest effort make American dyes as good as those previously im

ported from Germany?
The answer to all these questions in the same—because



showing the interdependence

of the interdependence of the chemical industries. interdependence must be clearly visualized not only for a proper understanding of the historical development of a given chemical industry, but likewise for an adequate a given chemical industry, but likt wise for an adequakt grasp of its present economic state. No proper non-grasp of its present economic at the control of 
the factory had to be located in reasonable proximity to salt mines or marshes lite depended upon the action of sulfure acid and since this w-priced and very dense. sul stance cannot support timep station charges acid fictory had to be tuilt mean tion with the side

works. But the process of meking sod in selffer in this way involves the formation of an equal side flished chloric and vipor—this must be recovered to avoid pollution of the air and is then does lived in water to form the commercial acid So that to make an alkali words More than that it was necessary to prepare two reads the commercial demand for s das for exceeds that for hydrochloric said that the full preduction of the latter only domanding that the extess be used up in some way it was transformed into chlorine and then into ble ching

then this old process for making artificial sida, which can be completely expressed chemically by means of the simple equation

#### 2NaC1+11/5()4=211(1+NnaS()4

must, from the industrial point of view be set forth in the following chart in which rise materials are entered in italies, intermediate products in ordinary type and finished products in capitals

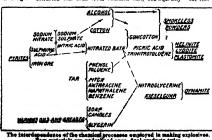
We have seen that hydrochloric acid is sometimes prepared for the doubli purpose of removing the noxious vapors from the air an i converting them into a product of value. In metallurgical operations involving the rosating of ores containing sulfur the sulfur laden vapors receive analogous treatment. But just as the users of this acid have to make it because it will not support transportation charges so the makers have to use it for the same reason. This they accomplish by making fertilizers and often nitril acid. They can sell these at a low price because they do not have to figure the cost of then sulfurous vapors in actual money as an ordinary producer would have to do. Of course such facts are most important in an economic survey of the industries concerned They may be charted as follows



Of course the facts set forth in these charts are sometimes modified in their relations to each other instance for from being a mere waste product utilized to prepare bleaching powder the hydrochloric acid of the that that is in some places the chief product. This is the case in the gelatine factories which use large quan-

tities of this acid to dissolve the nuneral constituents of the bones. In such fuetories it is to be remarked that the preparation of hydrochloric and leads to sodium sulfate as a hy-product, and that the manufacture of sulfuric acid is forced as an intirmediate raw product leading to the hydrochloric. Likewise in many explosive factories the manufacture of sulfura acid was established in order to reduce the cost of the nitre acid which could then be made

This nitric acid is the fundamental base of all our modern explosives, and it is for this reason that thic saltpeter (sodium nitrate) is not permitted by the Allies to enter Germany Reference to our third chart, which sets forth the principal ramifications of the industrial chemistry of explosives, will also explain the blockade on alcohol, ether, giveerin and cotton, in addition to showing how essential it was (Continued on page 216)



he chemical processes employed in making explosives s are underlined once, final products twice





A pile of brick on the drying car ready to be run into the chambers

Transferring the truck from one chamber to the next

## Speeding Up the Drier How an Operation Once Left to Sun and Wind Has Been Brought Within the Mechanical Field

WIII'N primitive man wanted to dry anything he exter the pricess he heard how to supplement or it lace the sun's heart down to supplement or it lace the sun's heat by artificial fare of his own. He must doubtless have obsaved that the question of air supply had something to do with the matter he cannot supply had someting to do with one makes as sames have failed to observe the difference in drying on quiet and on windy days. But that was as far mache ever got and that was where the matter rested until a very recent date. Means for supplying a more intense heat or a more intense draft were provided from time to time but this represents mer by a difference in degree, not in kind the advisability even the possibility of regulating the heat and the air in connection with the drying operation

nest and the hir in collection with the orying operation seems to be distintly a twent in c. intury conception. Now that this idea has been developed, however its application is being pushed in all fields where drying is done and it has lied to a fundamental revision of the realized that at different stages of the drying the material displays different degrees of moisture cont at and that its most advantageous treatment is to be gained only by subjecting it to different conditions of heat and ventilation suitable to these several stages. But the conditions which are not suitable for the material which has passe is a certain stage and from which therefore that material must be removed are exactly suited to such of the material as is just entering the stage in question. This observation leads to the progressive system of uve system of drying in which there are a number of stations in the

drying apparatus with dif-ferent conditions of tempera ture ventilation and himil its provailing at each 1 very article to be dired passes successively through each station remaining at each for the proper length time. In addition to mire chilous alvantages this system makes it pessible to conduct the drying with due regard to the fact that in certain degrees of saturasensitive to sudden removal of large percentages of its moisture content than it is at others, and that accordingly certain stages of the drying need to proceed slowly under pain of damage to the substance under treatment

This consideration is met in the seasoning of woods by the progressive system—an undertaking that has been fixed upon us, in lies of the sider and more dignified process of seasoning through months or even of years, by the necessity for speed in the production of wood for arriplanes and ships. When we ennot wait for the old process to work out we must d video big furnaces for escaponing wood artificially, and this is what has been

Each drying room consists of a tunnel holding a train Each drying room consists of a timel holding a train of ears of timer the care being a vanced periodically, say as; feet per day, in their pr grees from the wet end where they are located into the system toward the dry and at which the duly seasoned wood is discharged for this purpose, a line of rais rims the length of the successive chambers. Beginning a very most air, the drying proceeds in slawly into using temperatures and slowly decreasing humdities though the air used horoghout must be more or less insist to avoid case hardening and consequent injury to the wood. The drying gent is low-posers retering usually raised from wood refuse in the cheapest kind of a boiler. The latest his sto file steams it stand rend to be cerulating

latent heat of the steam is transferred to the circulating air, while the heat of condensati n is returned by a pump to the boiler Controlled on ulation is assured by introducing at the loading end a little to chill the air to the point where it is almost saturated, and by discharging to the atmosphere such air as becomes wholly acturated. In this way a rotary circulation of air is obtained without any mechanism tho great bulk of air being recirculated ai I relead to in the upward travel through the steam radiators, which are suspended below the rail level

travel through the steam radiators, which are suspended bloow the rail level

This system is largely used both in sawmils and in private establishments throughout Britain for drying. The progressive seasoning of wood as a British development Other applications of the same idea may be found in this country. First to crear to us is that in the drying of vegetables, interest were something like the two the country of the same idea may be found in the coloniant of the same idea may be found in the coloniant of the control of the

type, which roll up like a deak top when it is time to promote the various charges from each channes to the next. With these carisins down in their working pos-tion the chambers vectors a strong deaft from the adde, the whole idea of the untai-

lation being to gave and well pontre



General view of apparatus for continuous drying of letch

#### Packing Curv for Ships

All of the visuality of the control 
our rat/roads

Chean transportation was in an even core serious plight by reason of the fact that reasons were being suit faster than they could be replaced and yet were called upon to early across the Atlantic a variance and the serious could be replaced and yet were called upon to early across the Atlantic a variance and the serious form the serious period in time of peace with the serious period in time of peace with the serious serious period in time of peace with the serious attached to every opho foot aread. This led to an urbeautive study of methods of packing with the result that many negative methods were volved. We have

that many ingenious methods were evolved. We have shown several schemes of stowing motor vehicles in rail We have road cars. Another such scheme which has been used to a considerable extent a shown herewith

It is a plan for stowing motor trucks on flat cars Two cars are mounted on the main floor of the car and fill it completely but there is still plenty of room overhead and so two slevated platforms are constructed on which the wheels of a third oar are supported. This furnished a good method of shipping assembled oars. For overseas transportation it was necessary to ship cars in knock-down condition, so as to make an even more compact load as to make an even more compact load Our smaller fillustration shows a complete motor truck disassembled, with the parts coarfully stowed in a minimum of space ready for boxing. It was by using packing methods such as these that transatianit steamers were analied to carry record-bracking eargoes to Europe

## New Alloy That Does Not Oxidize or Change Its Form at High Temperatures

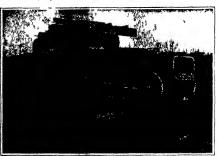
THERE is a distinct demand for a metal Tor an alloy that will withstand high temperature without any large alteration in tensile strength or especially any change in its physical appearance such as soling or oxidising. If toughness as well as results

oxidising. If toughness as well as resutnance to change of form are combined with the foregoing
qualities, then a wide field of usefulness at once becomes
possible if the metal possessing those proporties is
also machinebles, then its value is increased.
A new alloy is being successfully and commercially
made on a fairly large soils, which is distined to possess
all these proporties and which is being used to ad-



A complete motor truck packed for boxing

vantago mesvezal distanct fields of nadustrial application lt is composed of about 60 per cent mickel and 14 per cent chromatur, the remander being pracipally reen lt is being melled in crucibles and poured in sand molds an a special foundry for this purpose. It can be cast easily and in about any shape and in any weight up to 1,200 pounds. The fact that it can be used in practical



Mounting three motor trucks on a flat car

service at high temperatures with extremely long life compared with fren or steel has enabled the producers to find many important industrial uses for it Beades its ability to withstand high temperatures up

Beades its soling to withstand mgn temperature up to 1,800 to 2,000 degrees I shrenhet without shoration in form and with negligible oxidation, the new material possesses at these temperatures a strength of about

30,000 pounds per square inch. It melts at about 2.800 degrees, and when coll it has a tensile strength of about 45.000 to 50.000 pounds per square inch. In ad h tion to its unusual strength at 1800 degrees it is very tough at that tempor atur and will bend considerably befor breaking even when red or white hot. A demonstration of this quality is often in a leby the company by heating to a red heat a plate of the all 14 ment there and then striking it ofter with 120 pound sledge on the unsupport d cent r of the plate Stul born resistance to bending has been the result in each case

The general industrial application of this new alloy has broadened until it embraces annealing and carburizing boxes heating

retorts and convey or chains used at high temperatures is being incorporated in the valve seats and valves of internal combustion (ugines were baskets and other utensils where either heat or acris and chemicals or both at once must be withstood. It is the claim of the company that these annealing or carburizing shapes last about 6 000 hours as compared with only 200

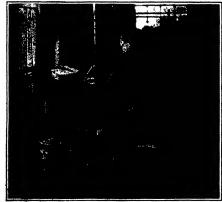
to 250 hours for steel boxes under similar conditions lie fact that it does not ovidist and scale off enables the boxes to be made thinker and lighter still man taining the strength and also insuring more

efficient heat conductivity
The company itself has a practic l
application of the use of its product which
is interesting. In the heat treatment of the alloy picliminary to drawing into wire it is necessary to pass it through an an nealing furnace at a temperature of 1 600 degrees. The ends of the furnace must be seaked with water to prevent oxidation by air The wire is carried slowly through and out of this unueder on an endless chain Because repeated heating and cooling Because repetited heating and cooling would soon destroy an ordinary chain the company uses one made of the alloy tiself which has met the conditions extremely well

Another important application is the of this alloy as pyrometer protection tubes. This type of tubes in the cast form is said to be extensively used and to be rapidly displacing the easily broken porcelain ones. In one case such metal tubes showed a life of 4 000 hours

The question of the use of this alloy for crucibles is now a matter of research and holds out some promising encouragement Experiments thus far in dicate the possibility of its adaptation to containers for melting brass, bronse phosphor copper and other alloys successfully buch a substitute for graphite crucibles would be a decided advantage under present conditions





This basket, of the new heat-resisting metal, is dipped in a het cyanide bath without interv

## Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

#### Handier Hammering

THE accompanying illustration shows a novel labor saving device irranged practically to attach a nucleasted ban l to the hammer and let it st the nails for the harmer in some cases one man does the work of tweeten with this device in many places the orjenter needs a helper to hold the board while he drives the nail. With this leve concerns can do it alone as he can held the board in place with one hard while driving the nail with the other. A one armed man equipp I will the levice, can drive nails as well as his two handed brother thus op ming another field of labor for him

It is pointed out that many carpenters have been killed by fulling off scaffolds while working in dangerous places be-cause they had to use both hands for ork leaving no opportunity to hold on With this device one can nul as far as he an reach and still hold on for safety with the other hand. It also does away with holding nails in the mouth

It is pointed out that because of the long reach possible with a hammer times when no scaffold is necessary, and where one is used it does not need to be moved up so often

This automatic hall feeder was developed at Grand Rapids Mich, and is a light, durable device which is attached to the hammer handle accurately feeding

the nails to the hammer

It is claimed that anyone can attach this automatic nail feeder to a hamme handle or remove it in a few seconds After attaching it is only necessary to fill the magazine with nails, then by pulling the trigger towards the handle, the takes one nail from the magazine, sets it right under the hammer

It is only required then to hold it in this position and at not firmly into wood, releasing the trigger and the hand re-leases the nail and drops back, leaving hammer free for driving nail home. It is not necessary to but the mark with the nail attached to the hammer, as might appear. It takes any kind of nails such appear it takes any sind of naiss such as shingling, finishing common, coated flat-head, without difficulty. The capacity of magnaine depends on size of naiss used. It holds about 40 sixpenny nails and has a net weight of only 7 ounces. A good running mate for this hammer is

a novel nad handle which saves a great deal of time. The busy packer must have the nails all the same way in his hand if he is to make time the nade are gone he grabs a handful from the keg and spends nearly a minute ~ an average of 45 seconds to be exact -m sorting the the Handy Nad Handler he can scoop up a handful of nails, have the heads all one way, and begin nailing

onds a saving of 40 seconds over the old

The handler is to all intents and pur-poses a hig comb It is only necessary to dig it into the nails, scoop up as many as it will hold give them a quick shake so that the nails will settle on the prongs, and one has a handful of nails with the heads all arranged the same way.



A magazine hammer which makes it possible to nall with one hand

which have long been sought, but which have either been entirely lacking or have existed degree in so-called "cushion wheels

The limited amount of remilency in the solid rubber tire and the lack of durability in the pneumatic tire for motor trucks, have led to the introduction of various types of "cushion" wi but usually advan-tages gained have not been sufficient to offset the duad

vantages The most of these wheels have obtained their resiliency by means of aprings which not only produce ob-jectionable recoil, but also inevitably crystalize and become useless

In the new wheel there are no springs, no working parts and no parts that require renewal during the life of the truck These wheels are practically the same weight as the ordinary solid wheels now



Handling nails by hand and with the comb-like instrument here described

the other hand one can take hold of the nails just below the handler, draw out the handler and the operator is ready to resume nating

#### A Wheel That Floats the Load

A NEW development in resilient wheels is constructed along entirely original It is claimed to posse

commonly used The axle is "floated" on a series of rubber cushions which radiate from the hub, distributing the pressure in all directions. There is no contact between the hub and the t except through these cushions. The cushions above and at the sides of the hub bear the weight and shocks equally with e underneath—a feature perhaps never

before possessed by any resilient wheel.

These rubber cushions respond to shock loads almost instantly, with very little rocoid, and will efficiently absorb shocks of widely varying intensities. Thus at due to the ample volume of soft reditent rubber which is exposed to the status at all times. The computing sides. resitent rubber which is exposed to the strans at all times. The opposite sides of these round cushions act as shock absorbers and neutralise practically all recoil. The cushioning effect is many times as great as that of the ordinary solid tire which is limited in its resiliency to the small portion of rubber acting at one time, and which encourages rather than controls rebound

The ability of this wheel to absorb Ane source or this wheel to absorb all radial, torque and side thrust shocks is obtained by each cushion being sup-ported throughout its entire cricum-ference, so that strains may be uniformly distributed over as much rubber as possible Inasmuch as there is no motion between any of the surfaces in contact, there can be no abrasion or wear

## Concrete Corn Crib to Keep Out Rate

IN England where the scarcity of food has been brought home to the people more than to the Americans, there is a law against having rate in the cornerib, and a heavy penalty is imposed on any farmer who allows rate in his storage.

against having rate in the cornerib, and a heavy possibly is imposed on any farmer who allows rate in his storage. Until connecte came into use in the country it was a hard job to keep the country it was a hard job to keep the corn of the country it was a hard job to keep the corn. The up-to-date farmer is using concrete more and more for building. Its lasting qualities are one big thing in its favor and in the case of protection against rate, it is about the only protected building material b effective way of fighting rate



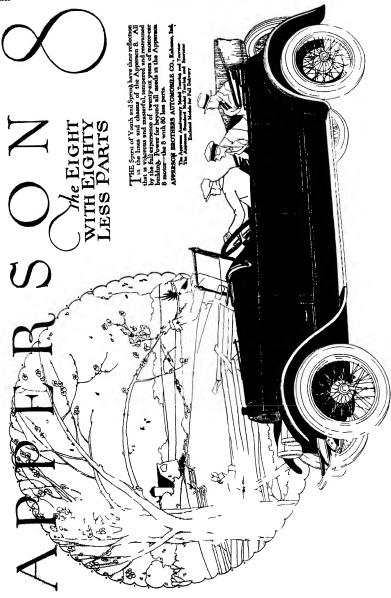






Wheels within a wheel, designed to give the effect of fleating the lead

The rat-proof corn selb of concrete



FIASH LIGHT I OD DAILET Tile-mook Ore The invention has for its object to provide mechanism in connection with the usual provide mechanism in connection with the usual hand flashingli for permitting the light to be run year from the casing without breaking the connection with the hastery and to be placed at a point removed from the hastery by means of an extension and as for in a s 3 in the band of the last wherein means s po valled in con-nection with the light for consisting the hast to support the same

CUT OUT SWITCH FOR AI PERNATING CURRENTMOTOR CURCUITS: FI Bina M waters 1873 Ralph Ave. Brooklyn N. Y Tible invention has for his general clies to provide a pretective means wheely the awitch will be automativally opened in a simple amore when any tuas in the motor circuit is blown. A more any fuse in the mitter circuit is blown. A more specific object is the provision of a switch in which the bladies are normally held in closel circuit position against spring tension by means of a lastic which is automatically released by magnetic means which is in shunt with the fuse

#### Of Interest to Farmers

Of Interest to Parameter
APPARATE 'S POIR HAND IN OR RACKE—
F I Lowresson Uctavia Neb The Investide
Apparation of the Parameter
Apparation of the Parameter of the Investide
watern bottle from the running gene of a wagen
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being means for looking the whose from president
during the litting of the rate to body
after the place of the place of the place of the place
Apparatus of the place of t

DRAFT THER 41 WILLIAMS SPOOK haven Miss. This invention rolates more par-ticularly to a device embodying elements adapted to constitute a doubletree and certain of which elements are adapted to be directly connected up elements are adapted to be directly connected up to form a swingister the objects belog to facili-tate the changing from one to the other and to provide for the absorption of shocks to the draft animals in starting with a load or in pulling a heavy load over uneven ground

heavy load over theren ground CILTUYATOR—B Bissows 27 Tilton 8: 81 Pauli Minn. The object of the invention is to Bit Pauli Minn. The object of the invention is to provide an implement which is especially adapted time wherein mones is provided for eliminating the weeds roots and all without danger of injury to the proving plants without danger of injury to the proving plants. The direct comprises a handle hardy capualisty being of skeldent forms and you hardy capualisty being of skeldent forms and you shade hardy capitalisty. TRAOTOR ATTACHMENT—8 8 Theories.

being of sasestor form and your shape

TRACTOR ATTACHEMENT — 8. Thomas

Panjas Texas

This invention has for its object
to provide a device adaption for state, hemes to be

rest whesle of motor vehicles for supporting said

whose not of contact with the ground and having

means for connecting the whoels to power whoels

in connection with the attachment for driving the

vehicle at a greatly increased power

## Of General Interest

COMBINED CIGAR CUTTER AND LIGHFER—C IL COUN 1711 A 8t 8 E Washington D C The invention relates gener ally to combined cigar cutters and lighters and more particularly to a mechanism including a cigar cutter the actuation of which automatically elect and presents a lighted match whereby the act of cutting a cigar will operate the ejector to discharge a match from the magazine first against a lighter and subsequently in lighted condition through an aperture of the casing

FIELD OUN PROJECTILE -C V RING-FIELD GUN PRODECTHE C V ROSE-tax I tue on Art E the invention relates generally to field gen projectics and more particularly to to shalls of the sceneral nature of strapped sales the prime object bodgs to provide for the timed relates of missing including propelling charges of this own citizen with our without the use of the massi strapped bold. The project the has a plur after if bores. Auxiliary projectics in the boors a fring it in sec. of the with our handless pro-

contained in the border of the service of the servi

RECENTLY PATENTED INVENTIONS other transportation companies or by theaten or other cital-biliments issuing tideous and extended to the cital-biliments issuing tideous and extended containing the patrons of add concerns on extended the cital chosents of work deleted.

CEMENT RAIL FOR HIGHWAYS AND CEMERT RAIL FOR HIGHWAYS ANY ROADS—JF O ROURES 1600 East Souls vard El Paso Texas This to soutton religion generally to roads and highways for vehicula-terdit and more particularly to safety road mak-ing means in the form of spaced parallel sadie



A PRESPRCTIVE VIEW OF THE BOADWAY

which may be quickly constructed of plantic material which may be molded or laid in sections. The roadway consists of spaced parallel side tracks and a central track of which the central track has a plane surface and the sides treaks iongitudical wheel receiving depression

COMB ATTACHMENT -F E BREEK care of Orinton 436 W 134th St. New Yeek, N Y The invention has for its general objects to provide means for removing dirt and dust from the hair imparting waves and luster thereto. from the hair imparing waves and luster thereto, removing static electricity and as the same sime taking the place of a brush. A more specific object is the provision of strips of vetwer as the roots of the teeth of the comb so that they will have a brushing action on the hair to produce the desired result

BILLIARD BALL — J P LAMBRET, 469 W.

Sol His New York N P Among the objects
and in New York N P Among the objects
and the property of the service of the ser

games.

FILING DEVICE —J MANOWN 742 Burdette Avs Svictoria B C Canada This invention has for its general object to provide a device especially adapted for use in offices, stores and the like wherein the cards are so arranged.



A PRONT VIEW OF THE PILING STOTEM

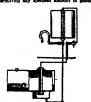
that the headings are always in sight and info mation data and the like may be added at as time without taking the cards from the system

between the carfax 111 rrl and the cutter with a continuity of the 
PAPER PADDING APPARATUS — 2 B. In stopped is you provide is celling in Whillis toffens in Source of the Company 
LAUVINIV MAILING PACKET—— F. REGEREN THE JOS & 68 Hs. L. S. Angles, Cal. Assaug in principal objects which the liverance is to entire the control of the con ng the packet

for element the packet

COUPLING —J JACOBA. 1161 Breadway,
New York N Y The Invantion relates to banness straps belts suspenders and similar strictles.
The object of the invantion is to provide a coupling
connection for connecting a strap or belt with a buddle trace book or similar davices and arranged
to disperses with the denbild-up portions of the
streng, and sitches for havening the partie quashing,
their reducing the cost of manufacture.

OASOLINE TANK—W R and C A Lavrace, 118 Lexington St. Covington, Va. This invention has for its object to provide mechanism for permitting any specified amount of gaseline



we be withdrawn from the storage tank into the measuring tank and to be afterward discharged fitto a supply tank all of the gaseless being held in an underground storage tenk so that only the actual quantity needed may be delivered. Machines and W.

Machines and Mechanism Devices Machines and Mechanism Proviews
BOX HEADING MACHINE—M J
Wazanza Peterboro N H The invention relates to a machine for fastening disk shaped beats
in metal or wood cylindrical box bodies by pefet
pricking the metal or wood of the body to form pricting the metal or wood of the body to read tawardly extending projections or barbs which bits into the periphery of the box head. A more specific object is the provision of a work holder in combination with a plurality of placeting els-ments having a rectifineer and pivotal move-ment, operatively connected with an actualing

ries.

LOCKING DEVICE FOR STOP MOTIONS
OF ENITTING MACHINES—O R. OPTRON.
St., 817 Murray st. Portamount Oldo The
invention relates to stop motions for kiniting
machines and more particularly to apprexius
in connection with stop motions for circuits
calcularly machines and the proposition has a



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whom are at least for the state being to the repaid of printing by tricks of them being to through or paint the engage theoretich.

FORTABLE PROJECTOR CARN -- F. C.

Terion address C R Presidenteer, 450 Fourth
Ave., New York, N Y The designation vestions.

blumbin of first places which serve to prevent from being drief up occupant of the paper at the same shape per mixing movement of the paper at the same shape per mixing movement of the paper for vertical may be supported thereto.

ALVUNDY MALLING PACKET.—E F shapes at the same shapes of the same table of the same shapes of the same the principle objects which the immediate may be supported thereto.

LAUVINDY MALLING PACKET.—E F shapes at the same shapes of the same that the same to provide a more passed with same the principle of the same in tries are to provide a more passed with same shapes are under state of the paper as a fact that the same same state of the same shapes of the same sh

PROPELLER -R C Bris Meson PROPERLIANCE — O EFIL. Missipan Year. The investion has for the policie to provide a device edupated for use with age chapteries of read, wheeks the propelling higher more always in a vertical position, severing and invests wis water in such position, severing and invests wis water in such position, severing and invests wis passing sevoke at approximately a right augie to the direction of movement of the veget.

the direction of movement of the vessel.

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Ruffwage and Their Assangeries
awitrCE.—E J ALLEGOW Whitelith, Most,
The invention has for its object to provide a
switch which may be automatically operated by
train carried means for opening or closing wawritch as all times when the train passes in rither
when the train passes in rither



direction on the main or side tracks, means are also provided for opening the switch when a train is to so into the siding, and means for automatic-ally latching the switch in open position and tripping the latching means after the train is in

the sitting Pertuining to Responsible
TOY AIRSHIPS—M Lowre 146 Naces
TOY AIRSHIPS—M Lowre 146 Naces
TOY AIRSHIPS—M Lowre 146 named to the first period of the same 
## (Pertaining to Validies SELF LUBRICATING LEAF SPRING.

SELP LUBRICATING LEAP SPRING—SI. Reser See N. 1948 Bt. Passwan, N. J. The object of the invention is to provide a garding serve specially designed for use on semigadifical sense specially designed for use on semigadifical sense in the second of the leaves without requiring atten-tion on the part of the owner said to outside to a unictensum the wese incident to the rubbing of the superimproved between one on the other. Assumed to the permits of assumptionizing the leaves of the contract of the owner seed of the con-pany of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the co

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Among the choices are to previous a pump than
may be readily applied to the spoites of a visual,
to provide a sufficient range of dispensance to
contrors to the visuals and thus of spoites shap
within reasonable listons, and in provide passes
within reasonable listons, and in provide passes
the operator from the seet orbits the operator.

We wish to on I attention to the flush that we are in a position to reader entapasses services in every branch of patent to tende-tangle woll. (per staff is composed of mechanical, shiptings and chemical experts thoroughly tradeed to properly and prosecute all patent explaned of the complete nearest the and velved. Or of the specialized, ten this important regulard therefor We also have numerical dispute who assist in the prosecution of p

mark applications field in all or the United States.

DEUNIN & CO., Russel, Mitanasan.
222 Brandway (Mail Mar. N. X.
oth College: 655 F Street, Walkington, D. Ci. . D. D.



## PERFORMANCE COUNTS

From coal pocket to consumer MACK Trucks are making the delivery of coal a certainty

Over ky streets that keep horses floundering, MACK Trucks take their full rated load with the same certainty, the same resistless power, the same hauling economy as in warm weather

In all sorts of heavy hauling—coal or corn, lumber or steel, cased food or broken stone—MACK Trucks show stemms and power, reserve strength and drive that get the heaviest loads through on time—with unimpaired efficiency—roads or no reads The embodiment of ever twenty years successful experience in motor track manufacture, MACE Tracks are built for lard work and continuous dependance-service. 50,000 miles with loss than \$20 for repeats as a sample of MAC.

performance.

MACK Trudes for every service—copsedites 1 to 74 tons—special bothes and trailers. Ostalog and fill information on request.

INTERNATIONAL MOTOR COMPANY NEW YORK

## YEYSTONE WAS THE PIONEER

copper-steel alloy-correctly and scientifically developed, likewise openly and frankly branded and advertised. The name KEYSTONE stands for all that is best in Copper-Steel Sheet and Tin Mill Products.

# Roofing Products

as formed from APOLLO-KEYSTONE Copper Steel Galvanized Shoein are most durable and resistant to rust. Actual time and service have proved that high grade steel alloyed with a certain percentage of Copper will withstand rust and

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corrosion to the highest possible degree. material assures long life and satisfactory wear from all forms of exposed sheet metal work Look for the Keystone below regular bran it indicates that Copper-Steel is used, and it is placed there for your protection

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## The Current Supplem

ONE of the most important movem In this country at present is the re-vival of our mercantile marine, and in making it effective a notable feature is the radical departure in methods of constructon that has been devised and success Inlly certraid out in our new shippards Many fragrentary allusions, have been made to the fabricated ship, and a clearer statement of just what this term means is desirable. This will be found in an article on Manufactured Ships in the current issue of the Scientific Ships in the current issue of the Scientific Ships in the current issue of the Scientific Ships in the Streinman, No 2202 for February 28th, Streinman, No 2202 for February 28th, Streinman, No 2202 for February 28th, Streinman, Indian Streinman, Indian Ships, and Ships, fully carried out in our new shipyards still to be found in various parts of that country although now only preserved for their bistoric interest. The paper on The Chemistry of Rissoring Matter is concluded in this issue. America s Food Resources calls attention to an important lesson of the war and the desirability of a more carrful study of the subject in the future Picking Goods for Shipment describes the methods adopted by one large organization which illustrate a matter of the utmost importance to every manufacturer who importance to every manufacturer who proposes to undertake foreign trade Internal (ombuston Engines is a valuable comparison of different types of motors especially those designed for marine proespecially those designed for marine pro-pulsion I its illustrated by a number of helpful diagrams Modern Welding by Bucincity points out the principles, ad-vantages and recent developments in a pricess that promises to have many improcess that promotes to have many im-portant applications in manufacturing process in the near future. Other arti-cles include The Meaning of I tie and Strip-pus g Negatives for Storage as Gelatine Films.

#### Influenza-The Sphinz of Diseases (Continued from page 200)

air passages of patients in the active stages of influence in addition, ten healthy men deliberately leaned over beds of ten selected influenza patients and allowed these patients to cough directly into their faces. Not one of the 68 volunteers de-

veloped influence.

(crisus French investigators particuherly Nicolle and Le Bailly, and Dugarric de la Reviere have within the past few d. la Revere have within the past few in this reported experiments which lead than it believe that the primary cause of influents is a filterable virus (By a filteralle virus is meant micro-organisms with har as tony that they will pass special filt is through which even the smallest, kin own bacteria will not go. I hase ay prim nots which have been confirmed by wetrus mysticators and desired by extent ert un investigators and denied by others still await scientific acceptance Even th ugl they be accepted they confess to an ignorance concerning the real nature hy ng agent primarily responsible for

If then we are fireed to conclude that il las not been satisfactorily proved that the Pfeiff r bacillus is the cause of inducuza and if there is considerable room for doubting that the disease is set up by a ilit rable virus what is the present status of ur knowledge? In an editorial in a read medical journals (Journ American Medical Assn Vol 71 No 26 Dec 28th

1118 p 2154) the case is succinctly stated.
The primary cause of influenza in so far as our knowledge at the present time goes, is an unknown agent that prepares the way for secondary invasions of the respira-tiry tract. To this confession, must be added another even more basic in its actic another even more basic in its significance. Again we quote, this time from The Report of a Special Committee of the American Public Health Association on Influenza "While the prevailing dison influence "While the prevailing dis-sease is generally known as Indisense, and while it may be so referred to in this statement it has not yet been astacke-torily established that it is the identical disease heretofore known byfthat name, nor has it been definishy established that all preceding outbreaks of the disease styled

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at the time 'influensa have been out-breaks of one and the same malady There is no known laboratory method by which an attack of influensa can be differentiated from an ordinary cold or bronchitis or other inflammation of the mucous membrane

To the intellectually honest man it is a wholesome corrective to be compelled to say rather frequently I do not know! say rather frequenty 1 do not know! Ouver Wendell Holmes once ro 2 (Medi-cal Essays Houghton Mifflin 1890 p 11) The best part o our knowledg su-that which teaches us where knowledg

leaves off and ignorance begins Nothing more clearly separates a vulgar from a superior mind than the confusion in th first between the little that it truly knows on the one hand and what it half knows and what it thinks it knows on the other

#### Industrial Cooperation as a Factor in Reconstruction

(Continued from page 100)

having the windows open lifeany shops in America are too hot One case was found singularly enough in the factory of a large concern making thermometers in which there was not a thermometer to show the heat of the rooms Sufficient literature on the man

of health already exists to transform the attitude of industry. All that is needed in to make it available to the workers and to furnish an incentive to have it read hygiene is not so well known though that

too is gaining recognition.

First aid rooms have shown that as an immediate result of their installation the The prompt prophylactic treatment of injuries makes for quicker recoveries. Shower baths and lookers for clothes as we money for the workers by enabling them to wear their old clothes longer in fact long past the time when they would seen on the street with such clothes

Shower baths are more sanitary than ib baths and the cleanliness and exhibits tub baths and the cleanliness and ex ton results in better work more output and more personal pride in the worker Cafeterias lunch rooms and casinos where workers can host the lunches they bring or huy food give more time for play reading and rest during the noon hour and have many other advantages b insuring that the workers have the right

kind of food at least once per day
Playgrounds and flower gardens have
their advantages and particularly for those whose work is of a nature that calls for very little muscular off rt

whose work is on a nature that calls for very little mucular of r utom in many range and ready and ready the first day of the annual shut down for vacations. Some industries are affected less by a general shut down for a wesk or two than by having va ations of the various members occur at different times. Cooperation with public libraries is a common practice in America but not nearly as common as it should be. There are not only public libraries that are perfectly as the common practice in America but not nearly as the common practice in America but not nearly as the common practice in America but not nearly as the common practice of their own of service in industry. Many large concerns maintain special libraries of their own for the use of their employees, specialising in books pertaining directly to their industries. Education of the members of the canastion will be one of the great tensing directly to their industries.

ganusation will be one of the great beneficial changes in the new era resulting from the War for Democracy Not only gaseral education—for this war has taught the public as has nothing else the benefit from education—but also superspecializa-tion in education for many of the same tion in education for many of the arts and trades as well as in the professions. It m recognized that the specialist is the case who can serve his own interests best. The great work already done by the Association of Corporation Schools is well known, and the needs will soon be greater than ever Perhaps the greatest mistake that the worker has made in the past has been that he too often has considered that the theorem of the considered that

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After bread Education is the first need of a people In education we suck the milk of democracy The present deplorable conditions in Russia are unquestionably due to the dense ignorance of its vast population while America s commanding position in world affairs is the natural out come of her system of Universal Education

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stopped going to school. The worker is more and more recognizing that this is not true. This accounts for the surprising increase in correspondence schools, which have done a stupendous good, especially in

Buyde racks and garages with an air compression are almost a necessity today, and help to bring the worker shome nearer

& Reduction in labor turnover on a systematic bans has been much fostered grat mate bane has been much fostered during the war when organizations everywhere were short of workers. It has its advantage also when workers are plentfull. The hardships to workers and their families due to irregular employment and the effect on the community of their lessenced earnings and preducivity are now generally appreciated. The shifting of apparent much to other pole in the same organizations has revealed that the management has in the past been as much at fault as has the worker himself in causing halp labor turnover.

fault as has the worker himself in causing high labor turnous benefit soosities excitatively for employees have proved that causely for employees have proved that the provide a most satisfactory opportunity for satung the worker who has committed an act that has injured has sellow workers to contribute a gift to the society instead of discharging him. The old-that has been sellow workers to contribute a gift to the society instead of discharging him. The old-that has been sellowed by the society instead of the shallow of heavy to contribute and a kinds with the shallow of heavy cohorastion and a kinds. abor turnover

Laboratories for research in best methods have demonstrated that larger outputs with less fatigue can be obtained to a surprising degree—It is not unusual at all to find that triple outputs and cause no more, and often less fatigue

With the aid of motion picture cam we are now able to record for all time the methods of the most skilled We can methods of the most skilled. We can now present these pictures not merely as motion pictures—for that is their least important use-we can project them as important use—we can project them as const utive lantern slides, examine each pi ture and see the motions and the recorded elapsed time of the motions of

the different methods For the first time in the experience of the world we now have perpetual cumulative improvement in industrial methods in form for 11 stantaneous presentation to learners, exp rts and teachers. Not only does this teach the best way known, but the manner in which it teaches reduces the time of the learning process
This has been demonstrated time upo

ness mas toen demonstrated time upon time in the industries. The General Staff of our Army has already recognised this fact and used this method for teaching the entire army of officers and men the one best way, with most satisfactory re-sults

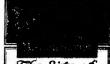
suits

Now all these 17 items here issted, as
has been said furnish a basis on which the
workers and the employers can continuously cooperate They furnish as
opportunity for getting the habit of cooperating Both workers and employers
help themselves as well as sech other by

help themselves as well as each other by systematism; these 17 subjects even during disagreements and the most heated differences on other subjects. There is another feature Such co-operation will result in increased outputs But are increased outputs desirable! Well, the public undoubtedly wants increased outputs because they enable it to buy cheaper. The employers also want increased outputs because they can thereby

mercased outputs because they can thereby get lower costs. Do the workers want sucressed outputs? They surely should, for only by increased outputs are seen peter with foreign countries. Before the war the workers of nearly all countries believed that manil output reasulted to their beselft on the theory that it results in giving employment to more people. The new workers, many of them but sem-skilled, have broken all goodneties meantly.

Now the soldiers are coming back in all comtrine. They want their ald who



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o that it is eveilable for planting about your come in your garden and orehard with the man surviving a processor as a grating of Appless. Bead about these woodsful trees in our 1910 medium, which will be sent five to more your content of the sent your five or movement of the set of your in making a selection for your win pacteristics.

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nd the way they will hold them will be through their greater productivity due to their greater skill

to their greater skill

The present semi skilled workers will
do their utmost to hold their present jobs
They too will have consideration for their
faithful performance during the war
The records in those foreign countries where the semi-skilled doubled the former records are well known to all The jig is up se one great leader of labor has said The as one great leader of labor has said. The worker in England for example now knows that England a chance in the commercial rivalry of nations is by big outputs as has been most wonderfully demon strated during this war. The same thing a true of France

The dawdling average German work man of the past will un loubtedly take on new life He must and he will make almost superhuman efforts to compete and his goods will fird their roundab way to all markets of the world if the price is low enough though they may have to consist of merely partly finished worked materials to be finished and assembled in

consist of mercily party nansees overset materials to be finished and assembled in neutral countries where the property of the

employee The 17 items listed in this paper form but a small part of a possible paper form but a small part or a possenor program They afford an opportunity for an instant beginning it is a necessity of national loyalty to make a beginning im-mediately. This list is varied enough to mediately This list is varied enough to provide ample opportunity for employers and employees to make a big start on cooperation even where they have in the past believed that their interests were

opposed
The slogan must be America for cooperation and maximum productions

#### Airplanes for the Transatlantic Flight

(Continued f om page 202)

The Handley-Page four engined biplane The Handley-Page four engined biptane with a pair of pontoons or some other form of marne chassis in place of its land chassis should be available for the translatantic oresum I in fact it is generally understood that the Handley-Page organ isation is making hurried preparations for an attempt. The largest Handley Pages with a spread of over 125 feet and a

Pages with a spread of over 125 feet and a carrying capacity of 40 passengers could be modified for long-distance travel by substituting fuel for passenger space. Last-minute advices tell of a British super-triplene which is claimed to be the largest machine in exustance now marking completion it is expected to make its free flight under Capatain Dunn at an early date Its capacity is enormous and al-though the inside fuel tanks limit the num ber of passengers to 50 future machines with outside tanks should be capable of

oer of passengers to of future monutes with nutside tanks should be expable of second models and the passenger of the passeng



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There are many methods of raising sunken vessels. Ohe is illustrated here. Practic ally all employ wire rope sings in which the vessel to be raised as cradied.

The U S Submerine F 4 which was accidentally sunk in Honolulu harbor in 1915, was recovered from a depth of 300 feet with wire rope

Before the work was completed a severe

storm snapped every rope but one. This was a lailow Strand Wire Rope of Broderick. Bascom masulacture which had alreedy served three years at railroad bridge coartruction on a nearby island. This is the kind of super service that B & B Wire Rope users are sociatemed to

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Fire German machine is reported to great fatteress from their ordinary us have a wing presed of 166 feet and stands all these things crosses conditions we more than 26 feet high. It has six motors, turn the whole industry of a nation agreed to total 1,800 hove-power, driving down, and throw its markets into two iractor sorows and two propellers willook confusions. Each air screw has four blades It is said ason an acrew has four blades it is said that two motors are sufficient to keep the machine in the air, hence the Germans too are taking no chances with engine failure and mefortune The reports la stress on the navigating devices, particu-larly the drift indicators, which make the let of its pilots far more certain than

The French and Italians are not believed The French and Italians are not believed to be ready for the attempt. The French have not developed super-airplanes to any great extent and while the Italians have bug machin so in the form of their Caproni triplanes it is understood that they have nothing ready for the moment
So in sum the transatiantic flight

promises to become a fast accomple within the next few months. More than one sirplane is ready, not counting the large dirigibles of Great Britain and Germany which are also available for the journey, and if anything, present a more sultable means of travel than the airplane

#### Every Man's Airplane—A Big Step Toward Aerial Transportation

(Continued from page \$02)

struts to be folded into the fuselage dur ing flight with a resultant reduction of head resistance. Indeed it is said that the speed is increased some 11 or 12 per cent by the retractable chassis

Tie dimensions of the machine are ex-tremely small the total span being under 18 feet. The claim is made that the machine can comfortably start or land on any country road which from the acrual commuter's viewpoint makes the machine practical since a large flying field is unpractical since a large flying field is un-necessary. The overall length of the maximue is 13 feet 4 mohes and its height 7 feet 4 mohes. The total area of the wings is 100 feet and the total weight 350

wings is 100 feet and the total weight 350 pounds in lidding signine. At the present writing no figures are 4x the present writing no figures are yet available concerning the actual performance of the machine but the estimate of 135 miles an hour at ground level, 112 miles an hour at 10,000 feet and 97 miles an hour at 10,000 feet and 97 miles an hour at 25 000 feet. In his opinion whin fitted with a 60-brare-power engine, the speed at 10 000 feet would be 145 miles are hour lists are to 100 miles are hour 100 feet. mile

Returning to the engine, we find that it is an air-cooled two-cylinder opposed "Gnat" A B C type which develops 45 horse-A B ( type which develops \$6 horse-power at 1915 revolutions per minute 12 he fuel consumption is said to be 0.56 pound per horse-power per hour, the total weight of the engine being 50 4 pound he hould have the land in placed in the upper main plane above the fussinger, and has a capacity of mee gallons or a sufficient supply for a two-hour flight. The mount-ine of the horsent supply for a two-hour flight. ing of the horizontally opposed engine in the nose of the machine and the hemispherical pot on the airscrew boss gives the maa very neat appearance, and, although it cannot claim to possess the beautiful lines found in many modern airplanes it is full of useful and original ideas. The machine will probably sell for shout \$2,000

#### The Labyrinth of Chemistry

(Continued from page 208) for Germany to develop the fixation of

for termany to develop the fixation of atmosphers natrogen.

This chart shows well the disturbance provoked in the chemical industry of a country by the necessity for producing large quantities of munitions it is necessary to build not only factories for explosives but also for sulfuric and nature.

scide it is necessary not only to produc dynamite and guncotton, but soap and candles and bensene. The abnormal consumption of certain raw materials, often necessitating embargoes against their normal uses the extraordinary production of certain by-products, the diversion of

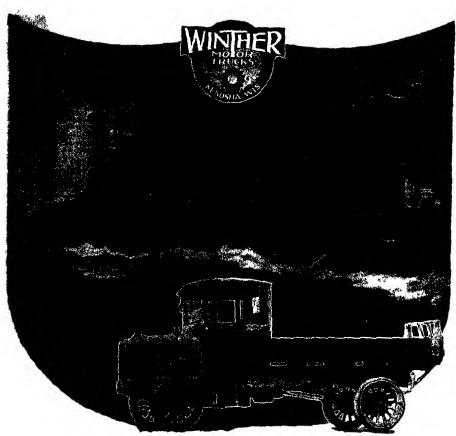
If the chemistry of expl plicated and far reaching, what sh pleased and far resolting, what shall we say of the processes of preparation of the thousands of dyes and other chemicals of the synthetic organic industry. No client on any such model as we have used could possibly be prepared to cover the faild, the attampt would only leed to contastion worse confounded. Even with the most complete knowledge, the close interdependence between all parts of the field often prevents effective production. Thus the methods of preparing most of the German dyes are very well known to our chemists. But mose files than not they German dyes are very well known to our chemists, but more often than not they manned secure all the proper intermediates, and the lack of one such substance will frequently prevent the manufacture of 20 others. And when a new product as to be made in face of the fact that all the sulfure and mitro plants have sold their suffered manufacture and mitro plants have sold their suffered manufacture and mitro plants have sold their entire outputs many months in advance to

the munitions works, the problem becomes impossible of complete solution Let us remember in trying to appreciate the difficulties that 90 per cent of the enormous production of German dyes is monopolised by five companies, which for half a century have been continually improving their methods, which produce themselves all the chemicals they need themselves all the chemicals they need and whole are financially powerful enough to crush out by runous underselling, any stempt at melependent production of important intermediates from many it would be wholly them shifts octabilish a new dye factory. Consequently when forman trade with the tribute was cut off, and with it the Grand trade was cut off, and with it the Grand trade and the contract of the contrac generally, interiors commercian and no exacting organisation to build upon—they had rather to go back to the very beginnings and duplicate on a smaller scale the whole tremendous German system before they could show adequate results. Under the

Fvon in industries where the raw ma-terials are simply modified without any aynthesis, chemical interdependence reaches a point unsuspected by the layman. For example, take the rubber industry. To make rubber resist changes of temperature it is vulcanized with sulfur and antimony it is vulcabled with sulur and antimony compounds, to reduce costs, dilution is re-sorted to with substances made from various oils, to make possible a thin coating of rubber, it is dissolved in a quancoating of ruoser, a scassored in a quan-tity of different substances, for the numer-ous uses it is necessary to add pigments, fabries, etc. We reproduce a most in-luminating graphical representation of the ramifications of the chemistry of rubber,

ramifications of the chemistry of rubber, gotten up by Brunok and by him christened the rubber tree "And so it goes in all branches of chemistry When, instead of mixing a samelers of the control of the products of the mixture, it is a matter of extracting everal intermediates or fluibbed products of the mixture, it is a matter of extracting everal intermediates or fluibbed products inversal intermediates or finished produces from one natural source, the interdependence of these products is absolute. It is only recently, after years of patient research, that a practicable method has been devised for extracting from entude petroleum more gaedine than it could gave formerly. Perhaps the time will count when it will petroleum, an abnormally high percentage of parsifin or bessel, seconding to marking or parsifin or bessel, seconding to marking or parsifin or bessel, seconding to marking the performance of parsifin or bessel, seconding to marking the percentage of parsifin or bessel, seconding to marking the performance of parsifin or bessel, seconding to marking the performance of the perf far from that To get a given amount of gasoline we must breat down a given amount of the raw oil; and in doing this we must, whether we like it or not, produce a given amount of every other petroleum derivative

All modern industries are more or less interdependent But the chemical in-dustries are on the ultimate pinnacle of interdependence.



# A Service of Which We Are Proud

Winther Standard roor drive motor drunks are built in cross apps, 1 1/6 to 7 tons

Winther-Margin jour wheal drive motor insuke are also built in corresponding trees, 134 to 7 has papeally "Winther-Morwin" means feet wheel drive

The 13g ion truste in both rear and four wheat dried are oupending designed for form use. VITH the coming of Peace, we are permitted to speak of the special service we have been able to render the U.S. Naval establishment during the

Wherever the Navy uses trucks, in Training Stations, Navy Yards, in construction and land transport, there you will find Winther trucks,—many standard Chassis,—many of special Winther design, developed for strengues and unusual uses.

Buying for permanence, it is not peculiar that the Navy has so largely used Winther, And the same qualities of durability, strength, power and economy which have there made Winther supreme, are making it also America's foremost high grade, heavy duty motor truck in commercial use. With every American industry you will find Winther foremost in service.

Important Note—In new of the present unsettled conditions in the material markets it is anportant to bear in mind that present it intheir process are purpraised without chinge at least uncel July 1st

We shall be jud to send you full description maifer of all standard Winther hear drives and Wintherbarton Jour which drive trucks and we shall correspondence concerning special chasses to made special needs

Winther Motor Truck Co.

Kenosha, Wisconsin

When the day's work is done



# SCIENTIFIC AMERICAN





IN MECHANIS, OL CONSTRUCT CAN IN-Diamond. The transfer of coloring of country anomobile changes (Eq. (1)) and the continuous to saible materials at a range color.

In performance, the Diamond Lor, clade proving these minimizes, manerials of a skall is be 100 personal ethicate.

Diamond T Magain 4521 W. 26th St., Chicago.

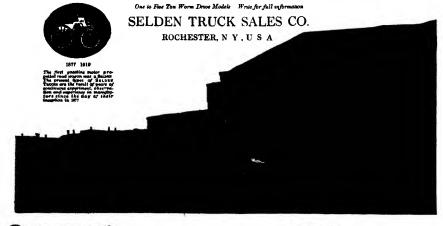
# Selden

Among the numerous users of SELDEN TRUCKS are many of the largest and oldest established business organizations in America.

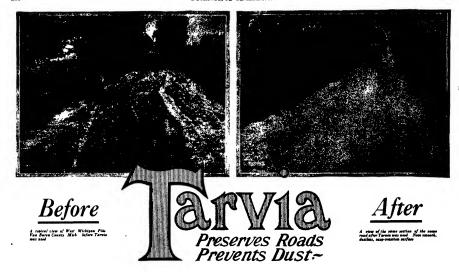
### SEARS, ROEBUCK & COMPANY

HICAGO for instance

217







THE "Before" photograph above shows a section of West Michigan Pike, Van Buren County, Michigan, as it looked in the summer of 1916

But the taxpayers of Van Buren County realized that such roads as this not only hampered the development of the county and made travel difficult, but that in the long run they cost the community more than good easy-traction roads

The "After" picture shows the same road, photographed at exactly the same spot, after macadamizing and treating with "Tarvia-B."

West Michigan Pike is now a firm, mudless, dustless road, water-proof and automobile proof, over which full loads can be hauled to market with speed and economy.

And wisely, the taxpayers of Van Buren County propose to keep this road

new. Last year they gave it a second treatment with "Tarvia-B". Thus at very small expense they protected their original investment and now have a fine piece of highway that brings their markets at South Haven and Watervliet miles nearer to each other.

The satisfaction felt over the vast improvement effected by the use of Tarvia is officially expressed in the following letter from the engineer of the Van Buren County Road Commissioners, Paw Paw, Michigan:

"The Van Buren County Road Commission has been using "Tarvia-B" for some years to maintain about 20 miles of macadam road and it has given the greatest satisfaction. We have entirely got rid of dust and ravelling and it is the opinion of many observers that the roads get better instead of worse. This year we had about two miles of macadam which was so bad that the State Highway Department advised covering it with gravel, but instead we patched the holes with Tarvia-KP (which by the way is something that is indispensable in our business) and total with the state of the Tarvia-B" and stone chips and today the road is in better shape than when new. We also have been trying out

"Tarvia-B' on a trunk line gravel road, the gravel testing about 15% stone. The results have been very good in spite of the heavy traffic. It produces a smooth, durable sarrier which will be better the second and third year than the first. We are now building a 30,000 gallon storage tank so that we can always have a supply on hand when we want it.

"Aside from treating the roads with 'Tarvia-B' there is no maintenance cost but a little attention to holes and drainage.

"Tarvia has solved our macadam road troubles

"Dans P. Smith, County Road Engineer."

Now that the war is over, the Nation needs more roads of this character properly maintained, because the public highways offer the only means of helping out the railroads and aiding our transportation facilities.

The use of Tarvia will give any community or state all-the-year-round roads that are dustless in summer, mudless in spring and fall, frost-proof in winter, and that are easy to maintain at a low cost.

Illustrated booklet describing the various Tarvia treatments free on request.

Philadelphia The New York Chicago Company Pittsburgh Cleveland Cincinnati Minneapolis Nashville Kansas City Salt Lake City Dallas Duluth Peoria New Orleans Richmond Elizabeth THE BARRETT COMPANY, LIMITED Montreal Winnipeg Vancouver St. John, N. B. Halifax, N. S. Sydney, N.

# SCIENTIFIC AMERICAN

#### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX.]

NEW YORK, MARCH 8, 1919

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Principal vehicular tunnel under the Budson river—a double-docked structure providing for three lines of traffic on each roadway (See page 222

#### SCIENTIFIC AMERICAN

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#### New York, Saturday, March 8, 1919 Munn & Co 233 Broadway New York

Charles All M Ir s Lat Ors n D M mn Iressum Alla C H ff a N etary all 1 235 Br adw y Entriff to 1 of 1 fN x Y k N Y x Su fruit Mirk H : (i 1 to 1 strail C ( vightit > 1 A - 1 to 8

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The I dit r is glid t have subjeted t him timely articles stated for these forms expending when such atteles wer mprellift gulle

III N we were informed that a rider had been attached to the Agricultural Assessment Bill stored to kill the Daylight Saving Act we experienced a distinct shock. It did not seem possible after having thoroughly tested out the benefits of day light saving last year that suyone could be so reactionary as to wish to return to the former condition of wasted morning light. When we harned that the opposition to daylight saving was mairly due to the farmers our astonishment grew apace We had always looked upon the farmer as one who delighted in early hours and who would love to have the rest of the world routed out of bed with the sun. And a in our perplexity we hunted up a farmer friend and be sought him for an explanation His reply was surprising to say the least He informed us that farmers re illy prefer the afternoon to the morning for work in the fields. They do rise early to be sure but the early morning work is taken up with chores Much of the field work cannot be done until after the dew is off the ground. For instance, hay cannot be cut while it is wet with dow the farmer must wait until the sun has dried off the moisture. Weeding also is done better when the score hing sun is high and when the weeds will withor immediately upon being nulled out of the Weeds that are wet with dew may actually take root again unless they are promptly withered by the sun I ast year farmers had difficulty with hired men who insisted on quitting work according to the new summer time, thereby cutting off an hour from the afternoon labors in the field. And strange to say the cattle did not take kindly to the new hour The cows stubbornly refused to come home when the sun was high In the skirs, and as hired hands refused to wait upon the whims of the cow the farmer was in a quandary indeed

However, the advantages of daylight saving to the rest of the country are so marked that we cannot possibly wish to go back to the old time schedule, even if it may inconvenience the farmer to some extent. Not only did the general public find it much pleasanter to rise earlier and have more daylight lessure time after working hours but there was an actual saving in lighting bills and consequently a saving of coal which we cannot afford to proore

any time schedule that is not based on the setting of the No doubt they would love to have us use the Turkish plan of setting our clocks to 12 cach day at the boom of the sunset gun

But we may reassure the farmer that conditions this year will not it so bad as they were last year for with our boys a turning from the other side and with many hands idle during the reconstruction period it will not be so difficult for him to obtain labor which will be willing to adapt itself to the conditions which the farmer

By all means, let us continue to save daylight

#### The Declining Supply of Motor Fuel

T I is almost superfluous to call attention to the ever increasing demand for gasoline every motorist has it brought vividly before him every time he stops at a service station It may not be generally realized, however that the consumption of liquid fuel is now proceeding at such a rate that an estimate can actually be made as to when exhaustion will be attained if there is no impi ment in supply or in use As our knowledge of our underground resources becomes more accurate it becomes correspondingly possible to reduce the margin of error in what once were more scientific guesses so that today we cannot afford to scoff at the technical man who tells us that there is in the United States a mere 61/2 billion barries of petroleum underground. The annual consumption at present exceeds one third billion barrels and it requires no extraordinary mathematical ability to divide 61/2 by 3 and get a quotant of 1914 Less than 20 years supply in sight if present practice is main taunc d

I oday we get back about 20 per cent of our crude oil in the form of gasoline. This percentage can of course be increased but not without mercasing the cost. Not must we forget that the stock remaining in the ground becomes heavier all the time, so that the vield of gasoline is bound to decline from this reason until finally we shall be able to extract but 21/2 per cent of gasoline from the crude product of our oil wells. The blending of highvolatile gasoline from natural gas with low-volatile gasoline from petroleum (an be carried out obviously only so long as we have the high viatile material to use in this way. This with equal obviousness will not be for long nor can we, even now g t any great quantity of high grade fuel in this was

By lowering the volatility of the gasoline, through the use of a larger percentage of the volatile petroleum the supply of engine fuel can be mercased but not indefinitely nor without disadvantage. In particular when we get fuel standards down to a point at which existing engines balk, what are we to with the millions of existing engines? Substitute fuels such as benzol alcohol etc may well be considered, but their price would necessarily be greater than that of gasoline today Nor would it be possible to manufa ture many of them on any scale without a complete overturning of a wide i dustrial field. The degree of interdependence existing in the very nature of things among the various trades using and manufacturing chemicals has been sufficiently emphasized by our wartime troubles with potash and nitrates and dyes I inally as we expect to show in an early issue, the oil shale deposits upon which so much reliance is placed for an extension of the gasoline supply to an indefinite period are not going to be of such immediate or such wide effect as the public has been allowed to suppose

tively decline, and the price will positively soar burden falls upon the engine It must adapt itself to less volatile fuel, and it must be made to burn fuel with less waste. To accomplish these results is the task before the automotive engineers who must turn their thoughts away from questions of speed and weight per horse-power and comfort and endurance, to avert what in the absence of effective attack will turn out to be a calamity seriously disorganizing an indispensable system of transportation

#### Coal-Black, White, Green and Blue

OST of us are familiar with the use of the term white coal to designate the power derived from streams In Europe a distinction is made between white and green coal Only the power derived from melting glaciers and snow caps is known as white coal, while other water powers are termed But there is another vast source of power, namely, that which may be derived from the waves and tides of the ocean, and this is now termed "blue coal

In a recent issue of the SCIENTIFIC AMERICAN we disussed the world a visible supply of black coal and showed that at estimated future rates of consumption, it could not last more than fifteen hundred years furnishes a virtually perpetual supply of power, but the quantity is limited If we used all the available water power of this country, it would yield about sixty million horse-power, according to estimates of the U S Geological Survey But much of this would not be commercially available as it represents the entire fall of all our streams Forty millions is a more conservative estimate and this is the equivalent of three hundred million tons of coal Vast as this total may seem, it would not begin to meet even our present needs, for we are consuming today about five hundred million tons of coal. In time we shall be compelled to supplement our hydraulic powers with other stores of energy

Blue coal, by far the greatest store of energy on earth has as yet been practically untouched. There are cnormous difficulties in the way of harnessing the ocean It is so irascible and when angered its fury is so violent that as yet no man-made wave-power plants have been able to stand up against its wild assaults

But we are growing more powerful every day Enguttering projects are being undertaken which only a few years ago would have been thought impossible The time may come when even the ocean temp obey the will of man and turn its energies to useful work More immediate however, are the prospects of using the power of ocean tides. The subject is discussed at length in the current Supplement So far, such little power as has been abstracted from ocean tides has been insignificant The rise and fall of the tides is not very great, even though it does amount to sevenly feet in some few places, and hence, if any considerable power is to be obtained, basins of large area must be used By damming the bay of Mont St Mithil in France, where the tide rises about forty-five feet it is estimated that enough power may be obtained to operate half of the industries of France A French engineer with vast powers of imagination has conceived of building dikes across the channel and across the Phames estuary to form two large tidal basins which may be used alternately to furnish a continuous supply of power. An ambitious plan, to say the least, but history teaches us that the visionary scheme of today often turns out to be the practical commercial auterprise of tomorrow

#### Papers for the Soldiers

HE various official and semi-official bodies which are concerned with the supply of reading matter for the Army have with complete unanimity written to call our attention to the fact that at this time, when magazines are needed more than ever, the SCIENTIFIC AMERICAN is not reaching the soldiers in sufficient quantities, and the reason for this is pointed

When we changed our dress at the beginning of the year, we searched in vain for a place on our redrawn and smaller cover where the so-called "Burleson notice would look well We did not find such a place, and not realizing that the omission of the notice meant anything more than cossation in reminding our readers of something which they now know by heart, we decided to leave it off But it appears that in the absence of the notice, the nost offices refuse to forward copies of the paper mailed at the one-cent rate, and that there is accordingly a famine of SCIENTIFIC AMERICANS at the camps and hospitals here and abroad

The SCIENTIFIC AMERICAN IS IN very great demand among the soldiers, and even normally it is difficult to make the copies received at the various army establishments go around We are rather proud of the outery that the Army has set up to have the missing notice restored, so that the SCIENTIFIC AMERICAN will come again to the soldiers, and we should be very happy indeed to restore it, even if it looked far worse than it does We urge all our readers who can by any possibility get along without the file of back numbers to avail themselves of the Burleson privilege and help supply the soldiers with SCIENTIFIC AMBRICANS

#### Publication Work of the Department of Commerce

THE Department of Commerce issued during the past fiscal year 1,141 daily, weekly, monthly, quarterly, annual, and special reports, the printing of which cost \$300,000 These publications contained a total 42,844 printed pages, and there were printed of them a total of 4,804,180 copies

The free distribution of many of these publications hmited to well-defined public classes. This policy is limited to well-defined public classes as resulted in a reduction of wasteful distribution statement issued by the Commerce Department sho that the Superintendent of Documents received \$32,993 during the year from the sales of copies of its publicstions In addition to the sales by the Superintendent of Documents, the Coast and Geodetic Survey received during the year \$20,194 19 for copies of Coast Pilots, Tide Tables, and Charts

#### Industrial Efficiency

Faver Accidents Now and Why War conditions, by branging large numbers of new and unakilided workers into industry, had in general the effect of increasing considerably the number of industrial accidents, both setually and relatively to the number of persons engaged in certain industries. Information recently received by the Inspection and Invastigation Service, Department of Labor, indicates, however that in general the number of such souddness has now returned to approximately normal figures. In a comparatively short time before the cutanos of America into the war, the effect of workmen a compensation laws and safety work had reduced the number of industrial accidents almost 50 per cent. The temporary increase due to the influx of war workers has now vanabled.

Big Forestry Scheme for France —Norway intends to help out the restoration of the deviated part of France, in the front sone, by planting a belt of Norsching forest trees — Much cithusiasm has developed for the scheine, and it is intended to begin work this spring. It comprises the planting of 250 acres annually party of about 50 Norwegains in streaming into Cousul Hubberg, at Christiania. The idea is to send a forestry party of about 50 Norwegains fully quiping with trees tools, tents, and stores so as not to impose the slightest burden on Prance. The tinature sone for planting the belt of trees is from Adreuiues toward the Belgium formetr, behind Arras, where there formerly was fine forest, but action will be taken in accordance with the designes of the French.

Nonacknowledgement of Orders by American Pirras.—The attention of the Monteroy (Mexico) Consulate has been called to the difficulty that local firms are experiencing in securing schoolwedgements of orders sent by them to the United States. This is a condition which was prevalent prior to the war, but with the added difficulties of trade incident to present conditions, the situation has been very much intensated it appears that firms here send orders to the United States and get no replies for everal week or months, and is some oases numerous telegrams are sent without any replies being received. Frankly this is not the way to handle foreign trade. Such methods may yet cause American firms to lose much of the overseas business that has falle into the hand during the period of the

Dend Sea Bitumen -lt is not generally known that ample quantities of bitumen occur in the Dead bea region It can easily be gathered and prepared for use in road making, and there is the advantage that it will be obtainable at much cheaper rates than those which now obtain in the Near Fast and in Lurope The material can best be applied by means of the usual tar-spraying machine Dead Sca bitumen was undoubtedly used in It is evident that the walls of the temples anment times and palaces of Babylon and Nineveh were joined with bituminous cements, and there are bituminous cisterns in Syria of great antiquity which are still watertight and fit for use A road surface treated with this asphalt according to modern methods may prove a most satisfactory solution of a very troublesome problem in the Near East, where, because of climatic conditions and the narrow wheels of vehicles, the macadam road is often a source of trouble, owing to the dust that rises from it

Safety Engineering -Safety work will be introduced in the curriculum of every technical school in the country, if possible, by the Working Conditions Service of the Department of Labor, as a means of promoting its plans for safety in industry. It is not planned to introduce special courses on safety work, but rather to inculcate principles of safety in connection with the usual instruction in engineering courses. The prevention of industrial accidents will mean a great economic gain to the Nation, for the annual loss in labor power is tremendous Recently figures were given to show that 200,000 industrial accidents occur each year in Pennsylvania alone, these accidents including only those which required absence from work. The training of technical men in such a way as to keep safety principles before them in their work in factories, engineering projects, mines, and the like will be an important factor, it is expected, in reducing the present heavy drain on industry from accidents

#### Science

Fire-Retarding Paints—From tests made at the Bursan of Standards it appears that while practically all paint contings have some line-ri-triding action none of those of far tested afford very grit projection. All the samples in question were materially damaged by application of fishing for a few sconds. Both sodium sitiation of shine for a few sconds. Both sodium sitiation and whiteweak rank comparatively high. These have the advantage of sheapness and an both he used on the advantage of sheapness and an both he used on the advantage of sheapness and in both he used on the order of the same surface. However work in the internal projection and the use of such materials shi did not be made an occuse for omitting any of the usual precautions.

Magnetic Analysis of Steel - 1 hr 1 5 Bureau of Standards has been engaged for a me years in developing methods and apparatus for using the magnetic properties of materials as an in hit tion of their quality and mechanical properties. A f ribcoming paper deals with the magnetic properties which might serve as criteria for the estimation of the much much fitness of steel describes magnetic methels of testing and dis cusses the relation between heat treatment of highcarbon steel and its magnetic projectics. The Bureau has applied the method of magnetic analysis to the testing of rifle-barrel steel hall bearing races and steel These investigations are of especial interest in view of the recent development of the permeameter for working the measurements which the Bureau is now learning to translate into the or livery terms of physical properties

Wild Life Reservations in Michigan -Mr and Mrs E K Warren, of Three Oaks Mich have just set aside as wild life preserves two tracts of land in Michigan One is an area of 300 acres mear three Oaks consisting partly of virgin forest of beech and maple the other of 250 acres, is in the sand dune region on the shore of Lake Michigan, north of Sawyer Bernen County preserves are incorporated in the I dward K Warren Foundation which also includes the Chamberlain Memorial Museum at Three Oaks opened in 1916 Both tracts have been set aside so that future generations may have an example of the primitive floral and faunal conditions of Southern Michigan and as a place for carrying out various studies in natural history The University of Michigan has been asked to make a detailed survey of the reservations and it is plauned to extend this survey over an indefinite number of years Field laboratories will be provided for this purpos by the Foundation

Studying Sound at the Bureau of Standards -A new branch of the U S Burcan of Standards the Section of Sound Investigation was organized in August. 1917, and has acquired a first rate equipment including the Lest types of instruments for determining the three distinguishing features of sounds vir, pitch intensity and quality It has also a good assortment of sources of sound and standards of comparison. While the section has devoted much of its time to military problems, including studies in sound-ranging etc. the apparatus acquired is practically all of it of permanent value for investigations of a general character. The Bureau has installed a Koenig clock fork the most refined instrument vet constructed for the exact measurement of vibration frequencies of tuning forks. A Webster phonometer of the latest type, for measuring would intensity has been constructed for the us of th Bureau under the personal direction of Prof Webster of Clark Um versity, Worcester, Mass. The Burcau has also see ired an audion, as used in radiotelography and a vrge collection of tuming forks, including a unique and valuable set of 37 forks covering the range from '23 to 4,186 vibrations per second by semitones specially made for the Bureau by a Chicago manufacturer At the Bureau itself has been developed a set of Reed phonometers," similar in principle to Webster's phonometer but very much simplified and used in considerable numbers, so as to give data for a number of pitches at once instead of only one For rapid but less accurate determination of the quality of a sound a simplified form of "phonodaik" has been devised Both the Reed phonometer and the phonodesk have been used in testing the efficiency of several types of muffler for gasoline engines used in aviation.

#### Automobile

Although the regular suplane, cupin apparently boson on place in the automobile field, the experience, with some place in the automobile field, the experience, with some place in Finding One (spe. 2) in 30 to that has been exceededly developed above the some interesting perposals in Finding One (spe. 2) in 30 to that has been exceededly developed above the standard engine, in which the vibrates as the radially around a common crash cose, it fixed and the erank shaftly driven in the regular way. Several Burtish manner facturers are proposing to build moderate powered engines of this type, specially designed and built for use in light cars. One of these is described as having five air could within the surface of the su

A Starting I rouble - As time I issue and gasoline" gets po rea difficulties in starting the engine increase Of course a large percentage of motor cars are equipped with electric starting devices still it is not a reasonable proceeding to everwork an expensive battery to offset defective conditions. We cannot control the quality of our motor i icl so it behooves us to give closer attention to the mechanical details that are apt to cause difficult starting. One of these which often gives a great deal of trouble because it is particularly clusive in its symptoms is a leaking joint in an intake manifold One of the commonest indications of this defect-that manifests itself after the engine has finally consented to start -is a sputtering that sometimes casts suspicion on the iguition and then on the carbureter and these manifestations are not always continuous but decidedly spasmeds Then it is well to go slow on adjustments, and look for looking joints and sticking valves

"After the War" Engines - there has been much talk about the wonderful engines that are to appear after the war but as has been noted, there is little likelihood that anything embodying notable changes will be seen for some months to come for the reason that manufacturers have been too busy in other directions to develop ucw designs and present models have stood the most exhaustive tests in the strenuous war work OVER there which would not indicate any very great necessity for a change just now "till evolution of the internal combustion motor may be expected to continue in its natural course and not a few engineers have dreams of future engines of wonderful economy and efficiency At a meeting of automobile engineers not long ago one of them said The internal combustion engine is understood in general but in fuel and efficiency problems special attention most be focused on it. Our engines are We must design engines that will use fuel not efficient more economically and not throw away 46 per cent of its thermal efficiency through the water jackets and 30 per cont through the exhaust as is done today greatly interest many of us to have some definite suggestions as to how these things are to be effected

Airpiane Engines in Automobiles A great many people are telling how the stock of airplane engines that has accumulated during the war can be utilized for pleasure cars but their suggestions disclose a decided lack of knowledge of the characteristics of the motors in question There are a great many reasons why such a use of these engines is not practical, but only a few of them will be meutioned here A very desirable feature m an automobile engine is flexibility which is practically non existant in the surplane type. It is true the automobile is equipped with change gears but few people even the most cuthusiastic would care to run a very powerful motor at full speed all the time. Then again the airplane engine is very lightly and delicately built and it is expected and usually necessary to carefully overhand and adjust after every trip and no amateur, and very few garage mechanics are competent to perform this work | The p ried of their maximum efficiency is also very limited Moreover the exceedingly light construction of the flying engine makes it inevitable that it would fail at many points and in a very short time as a result of the jolting it would be subjected to in a car As a last reason even the smallest engine would be altogether too powerful for the suggested work, and the man who took one of them out on a public highway ought to be indicted on sight, as there is no reasonable occasion for an engine of from 100 to 400 horse-power and a car with such a motor would be a menace to the community

#### The Proposed Vehicular Tunnel Under the Hudson River A Study in Ventilation

THE Hudson River is at once a valuable asset and a serious handless to the city of New York. It provides at unexcelled waterway up the entire length of Minhattan bland and at the same time its depth and trial expanse make. ir al expanse make : difficult river to span with imiges | 1 xeept for ti three railroad tunnels that have been jushed through its helt the only means of travel letwen the metropolis and cities on the lerses shore is by ferry. The inadequity of this means of com-munication was clearly demonstrated during the war

and the reent ferry strike emphasized the importance of stablishing a road way either above or below the river which could be used by trucks or pas

senger vehicles Our ferries have not sufficient (a pacity to accommodate the wheeled traffic that plies between New York and Jersey City On almost any after noun long lines of motor trucks and nassenger cars may be seen waiting their turn to get stand Frequently a car must await the loading of three or more ferries be-fore room will be found for it to lie taken aboard Clearly sumething should be done and done at once

Eighteen months ago a letter was pub lished in the carreished in the correspondence mage of the Settentific American severely criticiang a proposed vehicular tunnel under the Hudson River on the ground adequate ventila tim It was shown that the exhaust gasses of an arte ir ld minim a silerable quantities

t art on monoxide a most insidious and deadly posson which is injurious even wher present in quantities of six r seven parts of fair and the cor that to dilute the gases sufficiently to meure the safety through the tunnel u der normal traffic auditions would 45 000 horse power for the ventilation

evetem slove and at an annual cost of \$50 per horse power this would amount to \$2,400,000!

Although we do not hold ourselves responsible for statements made in the correspondence page nevertheless the conclusions reached in this communication were of so startling a nature that we checked up very carefull the data on which the argument was based and could find no serious flaw in it. A cordingly the criticism received our unqualified support and we supply mented the letter with an editorial vigorously condemning the construction of this tunnel for motor vehicle traffic

But our criticism applied only to the particular tunnel then prominently before the public and it must be re-vised considerably when dealing with the tunnel recom-mended by General George W. Goethals in his capacity of consulting engineer for the New York State Bridge and Tunnel Commission The former tunnel was elliptical in cross-section with a horizontal diameter of 1234 feet and a vertical diameter of 2234 feet. There was no division between east and west traffic and no means of making the sir currents flow in the direction of

accompanying views show it in longitudinal and cross-section. It consists of a tube 42 feet in diameter, built of pre-east concrete blocks, three feet thick, so that the inside diameter of the tube is 36 feet. A central horisontal diaphragm separates the tunnel into a lower west bound and an upper east bound roadway roadways are 24 feet 6 inches wide and with 13 roadway are 24 feet 6 inches wide and with 13 feet of head room they provide room for three line of traffic on each roadway. Slow horse-drawn trucks must keep to the right, motor trucks must hold the center line and slight proof passing and the create the contract of the create the cre

way the capacity is increased nine fold over the capacity of a tunnel with but one line of traffic

Although a 42-foot bore calls for a much larger pneu-matic shield than has ever before been used in tunnel work there are no apparent engineering difficulties in the way of its success The use of concrete blocks in place of a cost iron lining is somewhat unusual but it is not an untried experiment The Mount Royal tunnel at Montreal was built of such blocks, with perfect success From a tunnel engineers point of view the plans are feasible plans are feasible. The only problem is that of ventilation. Can the tunnel be cleared of poisonous gasses without running into prohibitive figures for the installation and mantanance of an adetenance of an ade-quate ventila-tion plant? We have consulted an experienced ventils. tion engineer and he samures us that it is perfectly feasible Above the roof of the upper deck and the aids walls of the two decks are large ventilation ducts Since our outs were made the design of the tunnel modified and modified and the horisontal partition beyond the side walls (as shown in

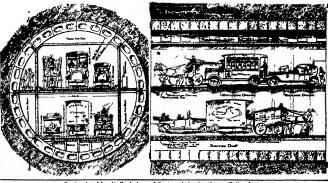
the sectional view)

ated maken total cross-se

the for

area of the air d 250 square feet

it will be recalled



Sectional and ignortudinal views of the tunnel showing the centileting duete



Fotrances to the upper and lower levels of the tunnel in Canal street at Hudson and Variet streets, respectively

the streams of traffic. The tunnel measured 5,500 feet between shafts and had a cross-sectional area of 575 feet or a total content of 3,160,000 cubic feet. To ventilate or a total contant of 2,160,000 cube feet. Fo ventists to tunnel a dust was provided with a cross-sectional area of but 52 square feet and through this dust are would have to be dryfts at a rate of 160 miles per bour, in order to provide judicional duition of the carbon memorate produced by a conservativaly estimated density of traffic

General Goethals' tunnel is a very different design perspective view of it is given in our frontispiece and the

Variets streets, respectively it will be recalled that the duct area was but 52 square feet. The agnificance of that the power required to drive a given quantities of the square that the power required to drive a given quantities of the commercial of the square that the control of the commercial part of the opening. Provision is made in this tunnel for two larger ventilating towers just inside the pier-head at either side of the river. These ventilating shafts will be 4,000 feet shart as against 5,500 feet in the old tunnel. With two lines as against 5,500 feet in the old tunnel. With two lines of care spaced of feet apart on ceates there would be 190 can between towers on each feet. But it is believed that 100 care between towers on each feet.

respite soers heavy registers a very registers. A very registers in very register and the condition of the c

is denser than are being 123 as assumed as a second of the control 
are to take ears of the carbon dioxids.

According to the original letter published in the Schwarzic America, an authority was quoted for the statement that six, an authority was quoted for the statement that six, and the statement has six parts of CO in 10,000 brings on sufficient in 10 miles. The statement was six miles by disting the carbon monoxide to 6.5 parts in 10 0,000 stubie feet of CO must be missed with 400,000 subie feet of coll nuts to missed with 400,000 subie feet of coll nuts to missed with 400,000 subie feet of coll nuts to missed with 400,000 subie feet of coll nuts to missed with 400,000 subie feet of coll nuts to missed with 400,000 subie feet of coll nuts to missed with 400,000 subie feet of collection of collecti

sour would amount to its moderate sum of soulous. Treasty-ser changes of air per hour represents a various active are discussed. The air move in the direction of the control of the contr

custom team and towerso.

Ventilation engineering is a very eract science and apparently there is no reason why a traffic tuned may not be built in which pure air may be maintained provided the matter is given adequate consideration by experienced ventilation engineers.



Raiph De Palma and the car with which he made a speed of close to 150 miles per hour

#### 150 Miles Per Hour on Wheels

IT was only a short time ago that we could rescrebly be believe our cyes when we read that an automobile had made a speed of 120 miles per hour or a mile in half a minute Since then, mile re or its have been successively amashed With the advist of the airplane we grew quite accustomed to think of travel at speeds of 125 to 130 miles per hour and so whose we learned that Ralph de Parkms, record, at Ormonic Beach on twee not half as actuathed as we re tilly should have been This figures out to nearly 150 miles per hour, or 140 8, to be exact Few surplanes have made as high a speed as this against the air To be sure with a following wind to help these, they have ex ceded this speed as an anaessured over ground, but 150 miles per hour without the ski of drift is an exceedingly high velocity and it as a speed on wheels at on wing. The car with which the record was amashed has a twin six aviation engine power plant. The former record for it for mile remanes, Ralph de Falms made some other interesting records. The mile from a standing start was made in 35 8 seconds. The records with flying start for two miles, five miles, 10 miles, 10 miles, 25 seconds, 10 miles might minutes 93 as seconds, and eight minutes, 452 seconds four minutes, 92 seconds, we minutes, 452 seconds four minutes 93 asconds, and eight minutes, 452 seconds represented.

#### American Substitutes for Boxwood

THE amount of genuine (Turkus) Fernan, Corscan, Lee English) beawed imported into this countries has been reduced to such an actent that the price is not been presented by the contribution of the countries of the contribution of the present the p

substitutes disknown which in all respects is the equal of boxwood for the more exact ing uses especi-ally for engraving blocks for printers It is, however, the opinion of the Forest 1 roducts Laboratory at Madison, that certain native fine-textured woods can be used to a large extent for some of the pur-poses for which boxwood is used

The properties which have given boxwood its repu

must be found in a saissfar tory substitute are respine and uniform texture, a fairly high degree of hardiness—so that the wood will take a fine polasi, will not wear away easily, and will work smoothly under tools—freedom from gumes and resus, and a light, preferably yellow-

Among our native woods only two species come anywhere near having all the properties of boxwood. These are Florida boxwood and wahoo, otherwise known as strawberry bush, or burning bush

strawerry buss, or ourning buss.
Florids boxwood, which grows abundantly in Florida and the West Indies, is a hard, yellowish wood of very uniform texture. Though it is somewhat coarser than true boxwood a fact which would be a drawback to its use for the finest work, it is probably the best substitute, when availability is considerable.

Whoo grows in most of the wooded regions east of the Rocky Mountains, but status the proportions of a tree only in southeastern Arkanese eastern leass and the Appalachian regions south of Pennsylvania. Its wood is not quite so hard as that of boxwood, but it has an even finer texture. Owing to the earcardy of merchastable material of this species, its value seems to be unappreciated. Trunks three or four inches in diameter would undoubtedly work up well into chessmen and rules, and larger sections could be used for engraving blocks of the properties of the properties of the proting of the properties of the properties of the protaining the properties of the properties of the prolation of the properties of the properties of the prolation of the properties of the properties of the prolation of the properties of the properties of the protaining the properties of the protaining the properties of the protaining the properties of the properties of the properties of the protaining the properties of the properties of the properties of the properties of the protaining the properties of the properties of the properties of the protaining the properties of the prop

A few other native hardwoods have somewhat the same characterates as boxwood and might be used for the less exacting forms of engraving or the manufacture of cheaps rules and novelities. Among these are witch basel, great rhododeadroin, mountain laurel, thornapple, orange wood, torthwood, mastic and yellow buckey. Mastic and torchwood might be obtained in sufficient quantities in southern Florida to make their exploitation profitable. The citrus orchards of Florida and California furnable a considerable quantity of orange wood sach year. Buffi-

(Continued on page 856)







Trient street wir withen (1815), Floride Surwood (center) and true bezweed, ) The average Inside diameter of the porce is, respectively, .025mm., .035mm., and .027mm.

#### The Heavens in March, 1919

#### The Death of Professor Pickering, and Other News of the Month By Professor Henry Norris Russell, Ph.D.

HE first duty of the astronomical chronicler this I mouth is a sad one to record the death, on February
3d of Professor Edward ( Pickering, the distinguished Director of the Harvard College Observatory, and the Director of the Harvard College Observatory, and the dwan of American astronomers. In 642 years of his service at Harvard cover practically the whole history of inciders astrophysics and in all this period of unex ampled activity he was a moving spirit. When he began his work the measurement of the brightness of the stars. had hardly been more than touched and the very definition of the scale of stellar magnitudes was still in debate. Only a few sporadic efforts had been made to photograph the stars and practically all that was known of their spectra depended upon difficult and inaccurate visual observations with small telescopes

In all these lines of fundamental investigation Harvard, anali these lines of fundamental investigation Harvard, under Professor Picktring, took the lead. The details of the scores of investigations which were extract to completion under his guidance of the Harvard Annals. Not even the haldest summary of them would be possible here. Suffice at to say that the conclusion of the control of th

the measurements of more than forty thousand stars, accepted as the inter-national standard the Harvard Library of Photographs developed into a collection of about a quarter of a million plates—each a unique record containing in some in-stances, hundreds of thousands of individual facts regarding the stars the Harvard Classification of stellar spectra like the scale of magnitudes adopted as the international standard, and the great New Draper Catalog, giving the spectra of about 220,000 stars completed in manuscript and partly printed

The expense of publishing the one volume of this last monumental work which has so far appeared was met by Professor Pickering himself—and the intense love of his work which is revealed by this was characteristic of the man No one could have been more unselfishly devoted to his have been more unscinsing devoted to his chosen calling, and he was always willing, to go out of his way to give any aid in his power to a colleague whether by furnishing him with material from the great storehouse of the Hervard collection or by bending his influence, and wise advice in obtaining new instruments or funds for the enlargement of his work. His de-parture will leave a gap in scientific circles, both in America and abroad, which will be very hard to fill

#### Our New Next-Door Neighbor in the Celestial Community

Turning from these memories to the nuring from times memories to the news of the astronomical world, the discoveries that deserve most comment are told in a copy of the Publications of the Astronomical Society of the Parific, which reached this part of the country only westerday. One note of decided

part of the country only yesterday One note of decided interest here deals with another near neighbor of our interest here deans with another near neighbor or our solar system—that is near as the stars go. This is a tiny star between the twelfth and thirteenth magnitudes in brightness, which was picked up by van Maanen at the Mount Wilson Observatory in the latter part of 1917, upon plates taken in a search for a possible faint companion to a rapidly moving brighter star. Upon companing photographs taken a couple of years apart, no such companion could be found but one of the monaphonous stars was found to have shifted its position. inconspicuous stars was found to have smitted its position very considerably, and to havethe remarkably large proper motion of 3 01 seconds annually. This rapid motion, which is exceeded by only a score or so of stars made it probable that the star was relatively near us in space

Observations for parallax were promptly begun by the discoverer, and now from 16 plates taken with the great Mount Wilson reflector, he finds the large value 0.244 geond, with a probable error of only one-thiriteth of its amount This means that the star is at a distance of about thirteen light years and nearer than all but perhaps twenty of the millions of stars which appear to pernaps wonty of the minimum of stam which appear us our eyes to be brighter. If it were not so very near us we could not see it at all for it is one of the faintest objects of which we so far have knowledge, being only 1-6000 as bright as the sun. Even Barnard's recently

discovered "runawaystar is two or three times as bright as this, and the only fainter star which is so far known is Innes's companion to Alpha Centaur!

The most ourloss thing about this newly discovered object, however, remains to be mentioned. Its spectrum is of type F, similar to that of Canopus, and indicates a higher surface temperature than that of the sun, and direct measures of the color show that it is also whiter than the sun, indicating again that it is hotter But if it is hotter than the sun, it ought to shine more brightly per square mile, probably two or three times as brightly, at the least, and this would mean that its superficial area was less than 1-10,000 that of the sun, and that it was no bigger than the carthi

there is no doubt that a body the size of the earth if it could be heated so that its outer atmosphere was at a temperature of some 8,000 degrees (entigrade, would be very similar to this tiny star in brightness, color and spectrum But there is very good reason to doubt that so small a body could stay hot—to doubt that enough heat could be produced made it to supply the loss by radiation from the surface

At 11 c clock Mar 8 At 10½ o clock Mar 16 At 10 o clock Mar 23 At 8 % o clock Apl 7
At 8 % o clock Apl 14
At 8 o clock Apl 22 At 014 o slock March 29

NIGHT SKY: MARCH AND APRIL

We know too little, however, of the sources of the heat the stars radiate so fiercely into space to make it which the star ranks so hereoly into space to make it aske for us to dogmatise upon questions of possibility. All one can say as that either this newly discovered body is hardly larger than the arth, or cless it is much larger but for some reason does not shine as brightly per equire mile as might be supposed from its spectrum and color—leaving it to future investigation to solve and color

#### A Double Star of Unusual Interest

A Double Star of Unusual Interest
A second communication of much interest, from
Adams and Joy at Mount Wilson, deals with a number
of new spectroscopic binary stars. One of these, known
as TT Aurigas, is of unusual interest for it has been
known for years that it was double on account of the
variability of its light saused by the alternating solipse
of each star by the other Now the spectrascopic
observations confirm the duplicity, two spectra being
vanile, with lines at sizes so weldy separated that they
indicate a relative velocity of 440 kilometers per second.
From the photometries observations it is known that the indicate a relative recently or soot knowners per second. From the photomester observations it is known that the period is 32 hours. With the orbital velocity of 450 kilometer, this would mean that the stars were 8,800,000 kilometers apart, and that their combined mass was about twelve times that of the sun. Now Shapley, from the photometric data, finds that

the diameters of the two stars are respectively 61 and 59 the cummerers of the two stars are respectively 61 and 50 per cent of the distance soparating their centers. This leads to the estimate that the larger and brighter star is 5,000,000 kilometers in disrester, or about three and a half times that of the sun, while the fainter component is of just about three times the dismester of our orb of

Both stars show helium lines in their spectra, and are probably much brighter per square mile than the sun, so that it would be a reasonable guess that the combined brightness of the two is three or four hundred times as great as the sun's As their combined light exceeds but intle that of a ninth-magnitude star, the distance of the em must be very great, probably as much as 8,000

these numerical estimates are provisional, and will soon be superseded by exact determinations, but there are so few stars for which the actual diameters are known that even these rough values are worth recording

#### The Heavens

The reasume
At our accustomed hour of watching, the splendid
group of the winter constellations has
swept far into the western skiese Canis
Major, Orion and Taurus he low along the
manufacture and western horizon Canis southwestern and western horizon Canis Minor, Gemini and Auriga are high above them, with the planet Jupiter adding to the brilliance of the second named Leo is bruinage of the second named Leo is very high in the south, with Saturn as an added luminary Hydra stretches its huge length below, with Crater and Corvus upon his back Virgo and Bootes are well up in his back Virgo and Bootes are well up in the southeast and east, and Hercules is rising in the northeast. Cassiopeia, Cepheus and Draco are low in the north, and the Great Bear rides high above the Pole.

#### The Planets

Mercury is an evening star all through March and is well visible about the time of his greatest elongation, which occurs on the 21st On this date he sets at 7 40 on the 21st On this case he sees at 7 40 P M and, being 18 degrees from the sun and 9 degrees north of him, should be con-spicuous, especially as he is unusually bright exceeding Arcturus

enus, too, is an evening star, and is growing increasingly conspicuous. She remains in aight until 740 P M at the beginning of the month, and at its close does not set until 8 50. She is about 10 degrees higher in the sky than Mercury, when the latter is at his best, and should serve as an excellent guide in finding him

Mars is likewise an evening star, but too mars is moving an evening star, but too low to be easily seen. On the 11th he is in conjunction with Mercury, and the two planets are only a degree apart, but it will take a good glass to pick Mars up in the twilight

evenight of the sun of the sun of the sun of the sun on the 28th. He is high in the sky all the evening, and does not set until well in the small bours. Sature is in 160, and is admirably placed for observation, crossing the meridian at 10 P. M. in the middle of

tion, trosse

tion, crossing the meridian at 10 P M in the middle of the month Urania is a morning star, in Aquarius, but is practically unobservable. Neptune is in Caneer, and observable telescopically till middight, or later to observable telescopically till middight, or later to construct at 0 P M on the 8th, rull at 11 A M on the 10th, in her late quarter at 2 P M on the 3ch, and have morning to the construction of the 10th, and have month without on the 10th product of the 10th product of the month without on the 10th product of the 10th product of the month without on the 10th product of 

#### Proposed British Bureau of Longitudes

The Royal Society has recommended the establement of a body corresponding to the Franch Bureau Longitudes, to which sould be relieved any adminitive question involving consideration of time or peak

#### Correspondence

The editors are not responsible for statements made in the correspondence column. Ascanymous commu-nications cannot be considered, but the names of cor-respondents will be withheld when so desired.

#### How Best to Make the Airplane Safe

To the Editor of the SCIENTIFIC AMERICAN: There has been so much said about the application of parachuse to pilot and observers, and the subject has been given so much publicity in the announced parachuse competition of the Aero Club of America, that a detailed, practical discussion of the practical value of the parachuse and the practical value.

of the paracoute on the surplane would be huminating, alike to aviators and to the public.

Airplane accidents may be classified into three categories: those occurring at high altitude, those at low altitude (near landing) and those which are to be idenaltitude (near landing) and those which are to be iden-tified as first. Off the three the second class furnishes the overwhelming majority of cases, for several reasons. The pitot on nearing the ground for landing is compalled to maintain a speed of about fifty miles per hour (varying somewhat according to the design of his mechine); if by any missabulation he falls materially below this speed, a cresh to the ground is almost inevitable. Moreover, at such a speed and at such close quarters with the ground, a little variation of the angle of descent very often causes a nose-dive which there is not room to check before a crash comes, or perhaps a capsising of the machine after touching the ground. With all these considerations foremost in his mind, the pilot must meet considerations foremest in mis mind, the pilot must need a third requirement; he must maintain correct horisontal belance during the approach to and the slighting upon the ground. In a forced landing, where the aviator is compelled to fly low around the limited area which he has picked for his landing, this is particularly

It is obvious that in these cases a parachute would be It is obvious that in these cases a paractute would oo of no await, there would be neither time for it to be used, nor the height for it to open. With secidents at high altitude is appears at first as though the revorse were the case; and certainly we must admit that here the para-oute will have sufficient drop to make it open. But such accidents are mainly due to loss of motive power, and ordinarily the pilot in such a situation saves both himself and his machine by skillful maneuvering. Bo true is this a pilot frequently shuts off his power pur-posely to dive at will; and his psychological tendency in an accident of any sort at a reasonable altitude is accordingly to sit tight and try to straighten out the machine. Besides, while diving accidentally at terrific speed he would have but little chance to extricate himself from his tiny cockpit and jump from the machine to take a chance for his life with a parachute—I say "take a chance with a parachuta" because in the comparatively few tests
made there have been eases where the parachute failed
to open. For instance, this occurred to the unfortunets
Leon Moles at Venice, Cal., on August 18th last, when
he stepped from his plane to death at an ultitude of 7,500
fest. Finally, even if the avistor got away from his
mackine and safely to earth in a parachute, there
always the possibility of fatality through the orash of the wild plane against other people or into a building.

A further cause of accidents would be by collision

which may cause, say the collapse of the motor. case the pilot could glide the machine safely to a landing, as he does when his engine goes dead from internal causes. Or if the wings had collapsed or the machine was a total Or if the wings had coulspeed or the machine was a total wreck in some other respect, the speed of fall would be so terrific that the pilot would have no chance to unstrap himself and climb over his seat.

There remains the case of fire sloft. In this case, which may be more or less serious, the pilot may have

which may be more or less serious, the pilot may have the opportunity to use some stalinguisher, as has actually been done in certain instances; or he may side-slip his machine to that the rush of air will blow out the fire. The only occasion where it would be really in order to consider jumping with a parachate would be in the event of a continuous first in the metor, with the latter in root of the pilot. But the present beginning in planes is more

of a continuous first in this mator, with the latter in front of the pilot. But the present tepdency in plane is more and more toward a multiplicity of motors, mounted far from the pilot and other conquisate.

With this catalog of the sources of needent before us, it is clear how very limited may be the practical utility of a paractuit attached to the pilot. Upon long consideration of those reasons, especially those persisting to low-stitude modelman seis fanding, which are by far the most frequent once, if she that the nod ymeans of adequisably insuring estaty on an airplane is a device that a would save both the macking and its occupants. Such a device that

and must be within easy and immediate control of the pilot. It should consist of a collapsible frame covered with light fabric randared fire-resisting. This member should be so formed that when fully developed it would about one so formed that when may developed it would form an emergency wing to engage the air in front and let it seeape through the rear. Note that a paraches cannot do that do necount of its spherical shape. The emergency wing or surface should be so designed as sta-stabilize itself automatically in fign position against any air pressure, no matter what the direction of fall. Such a device should have about ame-fortieth the weight of the machine, and during flight the major part of its weight should be earried idle by the flow of air. The device should not offer much head resistance when inoperative -- say, one-eighteenth the total resistance of the plane as a whole. It should be designed in such a way as also to not as a brake when required, especially in avoiding collision in close formation

Low-altitude accidents would be avoided, especially those incidental to landing, by the same device acting those incidental to landing, by the same devere acting to change subconstacilly the angle of flight upward, exusing the plane to lift its nose and arrest simultaneously attained to the stability that bride possess in landing -they will be noted to arrest jitheir speed by curing their wings and tail, while simultaneously they throw ther head upward and land on their feet. In other words, the air-plane should follow nature as closed as possessly plane should follow natures actioned as possessing the stability of 
It is obvious that we cannot expect in practice the wing of an airplane to reduce its speed, but an adequate surface should be developed against the rish of air, with such a pulling resultant applied at such a of the plane as to create a new rotating moment

point of the plane as to create a new rotating moment espable of adequately raising the nose of the machine at the moment of landing, while arresting its speed. On the other hand, it is understood that an airplane could not carve a different safety device against each different type of scoident. Hence the need for one good the device incorporated upon the machine with more the limitations of weight and air resistance that I have mentioned, and capable of such automatic move ments, by the flow of air itself, as to cause at the easy ments, by the new or arr itself, as to cause at the easy and secure control of the pilot whatever new automatic combination of forces might be needed to render the plane more bird-like and afford the pilot and his companions incomparably more safety than a mere parachute. GARTAN AJELLO.

#### Safety for the Standing Train

To the Editor of the SCIENTIFIC AMERICAN: Referring to Mr. Bued's derail and signal to protect Referring to Mr. Bradi's derail and signal to protect a workman, as pictured in the Reinvirus Alemican of December 7th, why not, as suggested by another practical railroad man, employ the salue means to protect a train? By the use of the derail and of another asf-curad as readly applied, rear end collusions, the most dreaded and destructive of all train wreeks, might be always prevented, or some as near it as luman means permit.

While all trains are protected in front by heavy locomotive, mail and express cars, the rear is exposed to complete destruction when a high speed projectile of a ousand tons perhaps, is hurled upon it at terrific speed tituusinat totis perinspa, is furried ujoni it at territe speed. Occupants of rear care on the best managed roads are in a sense always in danger, not increly to life and limit, but of death in its worst forms, by fire and steam, and there are those who never ride in rear coaches when others are available.

The suggestion is that all standing trains at stations The suggestion is that an attaining wants a sure the protected by turning a switch behind them, thus cutting them off from the line, permitting the following train, if out of control, to pass by on some other track, or in case none is provided to run off the switch and be

Out upon the line the derail would be employed to protect any train unexpectedly forced to delay. Carried always in the rear car, it could be seated at once upon the rail, where, in case the following train got by the fing-man, it would throw it from the track. It would as bstitute an intentional wreck for an accidental one a case of the greatest good to the greatest number, as where a building or a block is blown up by dynamite to save a much greater loss by fire.
I have before me the SCIENTIFF

re me the Scientific American of September 21st, 1912, with a list compiled by Mr Fisher of Taunton, Mass., of the wrocks of "our fast trains" in four months, peginning with December, 1911 There were 18 of them. hight were derailments, but by far the greater number of again were deraneouse, but by tar the greater number or fatalities in proportion were caused by collisions, where trains ran by signals and struck standing trains. Within a month of this writing there have heen four cases of this kind noted and all attended by loss of life. Apparently, had the standing train in every instance been protected by a switch or a densit, the loss of life would have been comparatively slight and of property much loss. A great general has said that in war nothing is left to

chance. It should be as true of the transportation of human freight. On the Mt. Washington Ranway, still the steepest in the world it is said, every precaution that ingenuity can devise is taken to prevent a runaway. But with trains following one another so closely on a level, with signals obscured by fog or storm, or over-looked by the tired or overstrained eyes of an engineer, there is nothing absolutely to protect the closely packed coaches, but isolating them from their pursuers on the

The greatest saver of life and property, the airbrake, was forced upon the railroad men much against their will. Why not force them still further to insure the lives of their passengers by the reasonable means noted? GRORGE S. PAINE

#### Concerning Cotton Seed

SEVERAL months ago we secured, through one of the commercial photographers, an attractive series of pictures taken in a cotton-seed mill. No member of our regular staff felt himself sufficiently acquainted with this rather special field of industry to prepare an article that would come up to the SCIENTIFIC AMERICAN standard; so we sought an outside source of information. put the pictures in the hands of a man who had con-tributed on similar subjects in the past, who had always shown himself competent to handle them, who said be could handle this one, and from whom we had every reason to accept this claim. In due course the article came along, and was printed without further scrutiny,

under the above title.

It must be realized that the editor of a sheet like ours peculiarly in the hands of his contributors. physically impossible for our regular staff to hold an expert on every department of modern science and inexpert on every repartment of monern science and in-dustry; there must arise many occasions when we have to call upon outside writers. When we sak such a person to contribute, it is because he is credited with knowing more about his subject than we do; and we must then ordinarily accept his discussion at its face value. We do not accept offhand anyone's claims or anyone's reputation; but in spite of the utmost care there is bound to be an irreducible minimum of cases in which our best judgment is betrayed.

The gentleman who was supposed to write with authority upon cotton-seed oil turned out to be ludierously ignorant on that subject. Apparently he con-sulted same inadequate works of reference, and perhaps one or two ignorant mill-hands, and got up on this founda-tion a typical high-school composition on cotton-seed oil. This he paimed off on the SCIENTIFIC AMERICAN as a scientific discussion. Some of his errors have been pointed out to us by kind-and unkind-friend

The fact that cotton-seed oil gums badly does not coessarily imply that it will never be useful as a lubriaccessing https://with every to discut as a futur-cant; some means will porhaps be found to overcome this objection. This fact, however, does make it at present out of the question for cotton-seed oil to qualify as a lubreant; and in any discussion of the oil of cotton as a substitute for the oil of the castor bean this item should be given first place, instead of being ignored absolutely. It is the present controlling factor.

Doubtless the placing of the world's annual production

of cotton-seed at ten million pounds, instead of as many tons, was a slip; we have verified that it was our contons, was a sup; we have vertice that it was our con-tributor's slip, and not ours or our printer's. Perhaps he knows that Egyptian cotton-seed has never com-manded a premium in America; if he does, his general statement that it sells higher than American seed is an

Our contributor says that the coating of lint on American seed runs about 20 pounds to the ton. The Government says that no cotton-seed mill may run unless it produces at least 145 pounds of lint to the ton.

Our contributor mentions a law against the stacking of seed near the gin, and he mentions a fan attachment for linears The promulgator of the law in question, and the inventor of the fan, have succeeded in keeping all

knowledge of their work from the millers.

Cotton-seed oil is not colorless; it is described as "mahogany red." American mills, instead of suffering "mahogany red." American mills, instead of suffering a refining loss of 11 to 15 per cent, feel that they have done badly when this loss exceeds nine per cent. Planters seldom dispose of cotton in the boll; ginning and baling are with equal seldomness done at the mill.

To date, these are all the inaccuracies which have been brought to our attention except that the photog rapher transposed the captions of two of his pictures, and that the self-styled expert never noticed the error Unfortunately, however, while a figure of .400 is highly satisfactory as a batting average, it is a trifle below normal in the preparation of a scientific article. We accordingly arise to express our regrets at the imposition which has been practiced upon our readers, and to assure them that they will not again be imposed upon by this writer.



Hydroplana leaving its landing stage

A BRIEF rev ew of th A BRIEF revew of t a ry II b avalarus tonduring hows, a ne ews gfat that prev o at the out a ke o a ne ews gfat that prev o at the out a ke o a ne a new grant branch had not bee whilv reduced. It was only with the agreement of fixed vit at n July 1914 the Chamber of Dep tee was preuaded to vote a small credit for the creation of a navalar server on and when a few days later. Germany declared was the general mobil sation found it a Prev in navy provided with only 13 sees planes name plots and 21 caddes. s ry f F h aval ava

p ots ma le their first reconnoussance flights under actual p ots male their first reconneusance flights under sotula war con! a Two seaplance were launched from the motil or sh! Two darks and the state of the purpose of exploring the enemys deferences at Cattaro A second vanture was attempted a few days later but the circumstance shaving auseed the General Staff to alter its views the available planes were sent to Port Saud where they formed a vedouse residince enemt to it a xeri airm. of tie Br t sh Fypt an army operat ng on the banks of the Suez Ca al

Sues Ca al

In the meanwhile several secondrilles operating from the
Channel ports had proved by the r day sad agit act vit set that the cooperation of the hithstro unter debranch of the navel serve e cuid second the efforts of
the surface; atrus to stem the rapid by growing U boat
menace. The first secolates center was organised at
menace. The first secolates center was organised at
menace. The server is several second tiles were located
to the sid ore of the Med terra, each of these were located
the sid ore of the Med terra, each at Toulon B server and
Brinds. The calls of the French army, however were
so pressing that the many was constantly compilled to
subordinate its den ands to that of the land forces. But
in spite of every.

in spite of every difficulty over 200 scapla os were distr buted to the var ous cent rs during 1916 while 300 more were added in the course of the

follow ng year The protect on of the numerous mer ing food and supescort of the regular convoys com ng from England Salon ca Egypt the maintenance of an efficient patrol over the routes fol lowed by the troop transports arr ving from America and Africa presented a problem which only tume and experence factor ly The first seaplanes were compelled by the r ex tremely small ra i us of act on to limit ther operat one to waters adjacent to the cosat line Lattle by Ittle as the models were amproved U boats e obliged to acknowledge that they

had found a worthy

foe n the aeral peats that humn ed and buzsed overhead. Even the stoot old mercha t at ppers, who at first were nelined to disdant he mpany of the arr navy changed their rainds when they saw the U boats diving for cover on the approach of the patrolling planes unt I today the saldrines are few indeed who have not s word of praise for the plucky airmen who have braved the dangers of both wind and wave to make the sea safe for them and their ships

There have been many accounts written of the work done by the French naval pilots on various occasion tone by the French mays, protes on various occasions, but nover has there appeared a comprehensive resumd of their achievements. For this reason the following table which we are ably to reproduce through the courtesy of the French Minustry of Marine s of espec as interest

ACTIVITY OF THE SEAFLANES October 1917-August 1918

| <b>)</b> | "EEF" | I     | 2       | *   | 1   | =   |  |
|----------|-------|-------|---------|-----|-----|-----|--|
| 1917     |       |       |         |     |     |     |  |
| October  | 1 667 | 8,004 | 184 730 | ۱,  |     | 1   |  |
|          |       |       |         |     |     | l   |  |
| November | 1 680 | 3,265 | 191 000 | 15  | 13  | 1   |  |
| December | 1 730 | 2 671 | 147 000 | 7   | 7   |     |  |
| 9.6      | 1 1   |       |         | 1   |     |     |  |
| January  | 2 280 | 4 189 | 214 870 | 7   |     | 8   |  |
| Pebruary | 2 116 | 8,690 | 2 5 900 | 8   | 6   | 4   |  |
| March    | 3 310 | 4 009 | 237 410 | 1 5 | 7   |     |  |
| April    | 2,647 | 4,808 | 284 920 | 111 | 8   | 8   |  |
| May      | 3 510 | 7 652 | 487 200 | 33  | 223 | 10  |  |
| June     | 3,865 | 6 758 | 887 940 |     | 11  | 9   |  |
| Juy      | 3 960 | 7 483 | 432 000 | 19  | 14  | 12  |  |
| August   | 4 208 | 8,594 | 495 700 | 20  | 19  | - 6 |  |

#### An Oil Tank That Can Be Towed Anywhere

DURING the war a most successful system of portable floating oil storage was introduced in Great British. This system makes use of a vessel which is not unlike the average submarne indeed as the subject of the cover lituatrat on for the issue it might well be taken for a state of the cover U boat until stud ed in detail

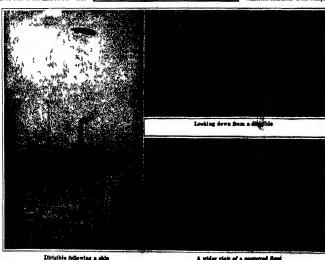
Il best until stud ed in detail
The new lir taka yestem of portable floating oil storage
may well be found useful and economical for many
harborn and fuel statuous bame quapable of removal from
posit on to position, as curumstances may require for
unknering vissels. The system adopted in those craft
is automatic-balanced pressure in each oil compartment
is automatic-balanced pressure in each oil compartment
is with the placed the pump ga and other gase. The
balance of internal and external pressures is maintained
is with its placed the pump ga and other gase. The
balance of internal and external pressures is maintained
by a limit in gwater by open seas connections while pumpng out the oil and nice reval so that the craft is pracically kept at a constant draft and trim, and the hull
avoids strains which otherwise arise from full and
empty compartments

avoids strains which otherwise arms from full and unply compartments and has been in continuous uses. The experimental for the boson in continuous uses. The experimental for an and partiting out this same volume of oil which has been repeatedly used to the test-ing of tanks in naval work. Careful records have been valued to the properties of the properties of the same taken during the whole period and proof is held that there is no admixture of oil and water this being pre-wisted by the internal arrangements adopted. This test has been very require it all comparisons of pumping in a could be been very required in all comparisons to the craft

An important fitting embodied in this system is an actrical indicator in the compartment which is operated

from the pumpradiating in the tank by hand from pump by hand from pump room space where a reguter is ac-curately taken as to the ollevel in the operating handle being fitted with calibrated scale so actual measurement of the oil is taken at any moment This fitmoment This fit-ting has given every satisfaction and is being fitted in other

The portable floating oil storage systems are worked under British other patents is also appl Shippin Shippin 10sumstances are



A wider view of a conveyed floor

#### The Monitors

### of the Present War

A Type of the Fighting Ship That Was Proof Against Torpedo Attack

get the against days of the war some old hathlablips, such a pick "Radoublable" and the "Veneralis," with extending continuous testin cruiters and guinous, singsed in operations explaint the Reignans on the Brigian cose, but when the fighting in Rimsders had become that the Certains were buy making best side of the Certain were buy making the state of the Certain side of the Certain section of the Certain of the Certain of the Certain operation of the Certain operation of the Certain operation up, or at Seate thiodoxyd As a

old mention of the Civil War-and the modern high-free-board coast-defense battle shap. These vessels were given the name of monitor Like that type, they carried a part of beavy guan mounted in turrets, but unlike them they had a considerable bree-board of from 9 to 16

The monitors were built in four classes, known as the Abstrorombie, Lord Clive, Marshall Ney and Erebus The vessels of the first three classes were of from 5,000 to 5,700 tons displacement and 7 knots speed in length they ran from 200 to 355 feet,

7 knote speed In length the key and from 200 to 385 feet, but they had the enormous beam for that length, of 90 feet, this brong due to this mo-called 'bitsers, hollow feet, that brong due to this mo-called 'bitsers, hollow feet, the brong due to the mo-called 'bitsers, hollow feet, and the seed of 12 to 15 feet. These bitsers can be a distance of 12 to 15 feet. These bitsers can be a distance of 12 to 15 feet. These bitsers can be a distance of 12 to 15 feet. These bitsers can be a distance of 12 to 15 feet. These bitsers can be a distance of 12 to 15 feet. These bitsers can be a distance of 12 to 15 feet. The service distance from the ship and allow the energy of the separating gases to expend itself within the bitsers. The device was very successful the monitors being frequently his without being sent to the bottom and in some cases with no service disablement the within the sight 14-feet gaus destinated the feet and of the sight 15-feet gaus destinated to the monitors are done to the better the sight things of the 15-m of game to the company and were taken over by the 3-fettlest Gevernment and distributed between the 15-m of game of the sight things of the 15-m of game. These were second from four bedween the start bank. They selectivelour game,

arised trith 4 we 19-moh guzas. These were secured frem four obsected to better four obsected to better the secured to be there in the secured to be the secured to be the secured to be the secured to be secured t

towers on either beam abaft the gun and on the roof of the housing are two anti-submarine guns

and their crews

Becaus f the huge blisters on
their sid s and their small borsepower these ships were very unhandy in heavy weather

ble system A valuable contribution to this work will be found in The (lassification of the first last letters the current issue of the Scientific American Supplement No. 2253 f r March 8tl. Fisting with Spiders MENN NO 2203 I r March 801 Fishing with Spiders Webs sounds lk fiction but that it has been and probably is today being dom in aboriginal inhalitiants of far Pacific islands is lemonstrated in an article in this seeue which is accompani d by illustrations of

proceeding es in Acc ma teresting ph t g aphs of a httle known I ucblo com nuttle known I tuble community in its chive stera country accompanied by some notes telling of the locality and the customs of the inhabit it is 5 gar from Several Points of 1 tag wes much valuable information than the statement of the statemen

about an industry of worll wide importance that is in timately connected with our daily food Feonomists are looking in many directions for additional sources of power for constantly the world is becoming more and more dependent on means to reduce and runforce human labor and new attention is being directed to the utilisa-tion of our natural sources of power Of course water is the most important of these

at present but little is being said just now about utilizing the ever present power of the waves although that has been a favorite subject with inventors for ages. The article on Blue Coal reviews and illustrates a number of auggestions for the practical employment of the waves of auggestons to the practical employment of the ways one of them being on a very ambitious scale The Seasoning of Limber is a compehensive discussion by a scientific forester of a subject of unusual importance and sets forth the basic facts underlying artificial drying and sets form the oast' takes underlying artinical crying of forest products. Other articles of importance in this issue include On the Fisence of Physical Rel intily and Fa After Transment of Bromide Prints. The formst discusses in a manner interesting alike to physicities and mathematicians some of the collatorial issues raised by

mathematicians some of the collateral issues raised by Finstein's doctrine the latter presents suggestions which will be of value both to professionals and



The "Abercramble", one of the larger monitors used in the bombardment of Zeebrugge She carried two 15-inch guns, with which she hembarded Zeebrugge from a distance of 20 to 25 miles

## their speed dropped dawn to two or three knots and at all times they were difficult to at r. In addition to the nation or eighteen larger monitors above mentioned several of a smaller type and mour ing lighter guns were built. If the information given on it by our Navy De partment is correct their were intogether some thirty of these monitors constructed or its important or their monitors. The Current Supplement

FIFTY years ago it was supposed that chemistry had been reduced to a fairly exact a inne. and it is really only within the last decade that it is some to be realised bein intricate it is in its orderin and many theories have been alsoberated to explain its contra lictory man relations on the contract of the contract



The 18-inch gun as mounted on the monitor "Lord Clive." The most powerful gun ever mounted on a warship



#### Army Telegraph Work in France

ACCORDING to a recently published account the Army has handled the extensive telegraph work incumbent on it in an efficient manner On November 15th, 1917 American telegraphic communication was opened between Bordeaux and Paris, with a few telegrams By November 15th, 1918 the small office had expanded into an establishment requiring a personnel of 50 men and a plant with 32 desk tolegraph outfits from which radiate circuits to 25 outside cities and camps. On one day, October 8th this central office handled as namy as 4.00 telegrams. One of the quokest wire-laving jobs on record goes to the eredit of men stationed at a rest camp near by At the time when the telephone exchange was moved from its former location to the new headquarters it. was necessary to n stall 100 circuits be-tween the new building and the French Exchange a distance of nearly a mile, through the busiest part of the business The presence of signal and pow wires in the air at various points made the installation of an overhead cable impracbackanatoli of an overland table impracticable A full Infantry Company of 220 men was selected for duty. They went to work at 7 P. M. with picks and shovels, and with the aid of 12 acctylenc search and with the aid of 12 acctylene search lights they worked all might At 7 A M they were relieved by another Infantry Company increased by another Infantry Company increased by the search of the Signal Corps; 50 men and 20 colored stevenions 17 few work continued in than way from 7 P. M Triday sight until 2 A.—M Monday, when the states cable was completed.





Transforming British soldiers into civilians. At the left they are heading in their riftes and other equipment; at the right they are being measured for the civilian clothes which the government will forward to their homes

#### Reconstruction in Europe—IV

From Fighting Line to Factory

By C. H. Claudy, Foreign Correspondent of the Scientific American in London

In A Job for Every Man in the Scientific America America To Documber 23st a naturapt was made to show how the United States was handing its demolistation problem from the standpoint of the individual soldier ta the State the problem is largely one of the individual for we have taken but four millions roughly from a total population of over a hundred millions.

and our commercial expansion is such that there are more jobs certainly than there shere are more jobs certainly tran there are skilled men to fill them, and probably enough jobs for all the unskilled if a reasonable interval is allowed for the ab sorptive power of industry to work upon the demobilised men

In Great Britain, however, the problem presents complications which America happily does not have, and it is, therefore to the greater credit of the nation that such very comprehensive plans should have been worked out well in advance of the need

worked out well in advance of the need It may be wise to consider for a moment the real problem of all demobilisation, as opposed to the view of it entertained by the thoughtless, and particularly the relative of the man to be demobilised It is no more than natural that mothers cannot understand why their sons cannot cannot understand way their sous cannot be immediately released, when the need for their services has passed and demobilisation means to many who have not reflected, merely the process of transport-ing a soldier from fighting field or training

ing a soldier from highting field of training camp to his home town and turning him loose but to those who must guard the welfart of the body politic as a whole regardless of the wishes of loving relatives, demobilisation means the intricate process of turning a war machine into a peace machine of relocation of men in constructive and productive labor of salving as much as may be of war equipment of turning factories and

1

Demobilized men receiving their unemployment denution policies at the Wimbieden Dispersal Camp

depends, in a very large measure, the solution of the question as to whether the world is to be a safe place for a true democracy or a breeding ground for Bolshevam. The limiting factors in any scheme of demobilisation which is to be comprehensive and effective and not end in catastrophe and fold serve first, transportation, second, distribution of labor, third, absorptive power of in-

industry generally from the production of monutions to the production of those things which peace needs, all swithout interfaring with the fundamentals of human life—food, clothing, shather—to such an extent as to cause first physical and then mental distress.

Upon the success with which this task is performed

mber of men ean be flung into industry, the ability of industry to turn from making, let us say, shells to baby carriages or from artillery wheels to automobile wheels, must be considered, and finally, before any industry can resume its peace base char-acter it must be assured of an adoquate if not an ample supply of the raw materials by means of which it actes. The supplementation of the supplemental of the one of the supplemental of the supplemental on more to England than to America But the Englash method of fitting her demobilisation scheme to the fundamentals is very complete and very well worth study

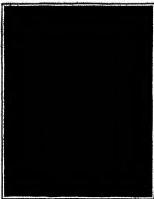
study its most salient characteristic is that men are to be demobilized not by military units, but by the requirements of industry in other words, demobilisation will be by midvaluels, not by companies, regiments or other military divisions. This is more difficult, from the military point of view, but influsted by preferable from the common count of were

but affautely preferable from the economic point of vew part of the point of vew part of the point of vew part of the fact is not plann, it may be many to the troops abroad to demolities all the troops abroad for first, thus gridge them the "pack of the jobs," merely because they happened to be on the spot, Agan, demolitaing by individuals and not by military units means an infinite duplication of orders, routing, collection, porcing, feeding and housing—to do these things for a regiment is one thing—to do the property of the property o (Continued on page 228)





Demobilized men being fed by the W. A. A. C. as they pass through the demobilization came at Wigibledon





The "accustic lens" of the hydrophone, seen from outside the ship, and an interior view showing the operator at work

#### The Hydrophone for Locating Submarines

#### An Ingenious French Invention That Did Much to Make the Seas Safe for the Allies

MUCH reliance was placed, during one period of the sur, upon the use of airplanes in the detection of submarinas. The fact is, however, that when the U-boat submerges to a depth of 15 yards its whitish treal is invisible from above, and we must fall back upon some other means of losating it, and thus onesan wound of the count waves propagated by the review and sublished the count waves propagated by the review and sublished better that which they extend that while these waves travel through water with a speed four times that which they exhibit in air, there is no nosability of perceiving them directly war. It as no possibility of perceiving them directly by ear. It is necessary to have recourse to an instrument which can is necessary to navy recourse to an instrument which can pick the waves out of the water and transmit them to a listoner lodged in a habitable medium Several such devices existed before the war In addi-tion, a quantity of inventions of one sort or another have

listoner lodged in a habitable medium. Several such deviewe autated before the war In addition, a quantity of inventions of the sort or another have seen the light of day since. The range of all these listeners varied greatly, being affected by factors as yet imported to the sound of the sort of another have seen the light of day since. The range of all these listeners varied greatly, being affected by factors as yet imported to the sound wave are received. On the average, the hydrophones of common type will detect the presence of a submarine at a distance of two or three thousand meters, and of a large surface squadron at ten or a dozen kilometers. But all these instruments surface from the very grave diadvantage that they will work only when the size of the sound wave and they are monitored in stopped, so that its same of the sound there is but one sound they modute only in the crudent fashion the direction from which it is received. There was encordingly the very obvious and very crying need for a hydrophone that would work white the slip was remained, and that would be estimated to the same to be sound they modute only in the crudent fashion the direction from which it is received. In the old it was a French navel lieutenant, George Weber, who solviewed the success which had cluided the world's avanta for three years. He solution of the problem is a highly ingestions one, depending upon a very simple principle of privation, yet one which it is not coursed. In the cent it was a French navel lieutenant, George Weber, who solviewed the success which had cluided the world's avanta for three years. He solution of the problem is a highly ingestions one, depending upon a very simple private of the sound of the problem, is an even of the sound of the problem, is an even of the sound of the problem, is an even of the sound of the problem

sufficiently remote, which remain parallel so long as no obstruction is interposed in their path and which are

amounted year-one states than a manufacture of this as no as they are abled upon to enter a medium of different density from that in which they are propagated. And it is just so with sound waves. Walser therefore interposed, in the path of sound waves, a sort of sounds least Just as in the case of light, the causes the individual waves which make up the sound complex from a given sure to come to a foous, with the double effect of straightening them and isolating them from the sounds this proceed from other sources. In fact, the several sources of sound give rise to as many fort, of which the glometric locus can be care in the complex from a given the position of the sound focus which pretains to any particular source of sound, the position—of at least the direction—of that source can be calculated.

Once the general idea had been formulated it remained for the lieutenant to work out the practical details. As finally adopted and used with these success

details As finally adopted and used with huge success in the detection of submarines the a outsic lens was in the form of a spherical segment A set into the side of the chaser or destroyer. In the bulging surface of this are a series of circular holes B each filled with a sensitive where so circular noise is each thed with a schmitter vibrating plate C. The effect is to focus relations all sounds received and the focal points all lic on a circle I, whose position of course, depends upon the radius of the lens



Working sarts of the bidrothese (see text for references)

segment and other factors which can be controlled. There are two of these lenses on each vessel, one to port and one to starboard. The two give upon a single cabin, which of course extends the entire width of the abin, and is well insulated against sounds at all points aver the two lenses. The observer is seated in the center of the cabin with a listening helmet to which are attached two ear-tumpets of which only one is absured in the context of the cabin when the starburger of the cabin care.

the the second the sec appears in the general view, and the mechanism is so adjusted that as the operator turns the handle of

adjusted that as the operator turns the manor or this drum, the two trumpets revolve about the respective focal circles of the sounds received. The counterweight J and cord is hold the trumpet in a position where its axis is constantly directed toward. a position where its axis is constantly directed toward the center of the spherical lens. The counterweight L maintains the equilibrium of the mobile arm F. The counterweights M. M. cause this arm to oscillate about the prote N, N. in such manner as to counterbalance the effect of the shup s intching and keep the mouth of the trumpet always in the same horisontal plane entire apparatus is supported by the frame O

In using the apparatus the observer can hear a given sound, not only when the trumpet is precisely centered at the focal point of that sound but when it is anywhere in the neighborhood of that point. He hears it loudest passes through the focus so that the trumpet is centered about the focus He explores the field by keeping the trumpet continually in motion and he locates every suspicious sound by carefully bringing the trumpet to the position where it is loudest and clearest. The in-strument has been previously calibrated so that when he succeeds in getting the maximum intensity for a given sound he reads the direction of its origin on the scale that runs about the edge of the drum. The distance is then estimated roughly by taking account of the intensity of the sound at its maximum and it is then easy to steer a straight course for the source-and if the latter be a submarine, to pass directly over it with mathematical accuracy and drop sudden death upon it

The first successful experiments with a more or The first successful experiments with a more or less definite model were made on March 21st, 1917. After that, progress was also both in the way of removing the last technical obstacles, and in the more difficult business of convincing the "appropriate authorities" that here was something good. All these difficulties were surmounted, however the apparatus was installed, and on March 16th, 1918, it received its beparism of fire. Its success was immediate, and from that date to the and of the way it made a very large contribution to the end of the war it made a very large contribution to the sullification of the submarine mensoe

# A CAMPAIGN TO PROTECT YOU IN BUYING



ALPH WALDO EMERSON, speaking in one of his essays of a distinguished man, said: "He is put to-

gether like a Waltham Watch."

No finer tribute was ever paid this American, masterpiece than when the Sage of Concord used it as the symbolic character of greatness.

The Waltham Watch represents the genius of many men whose inventive faculties have been concentrated for nearly three-quarters of a century to make it the wonderful time-keeping device it is

Among these famous watch makers and inventors is enshrined the name of Duane H. Church—a man whose marvelous grasp of the principles of mechanics filled the great shops at Waltham, Massachusetts, with exclusive machinery that performs miracles of accurate and delicate work which the human hand could not equal.

Many of these machines are awe inspiring to the beholder. One of them will do the work of a hundred skilled workmen—do it better and with



Duane H Church, fumous tracestor who filled the great shops at Waltham Massachusetts, with evolution worthmoting machinery that porforms mirecles of accurate and

greater accuracy. They demonstrate American mechanical skill at perfection.

To see these machines is to know beyond the shadow of a doubt why Waltham is the "World's Watch Over Time," and why the foreign-built watch cannot compare with it in time-keeping dependability.

# WALTHAM

THE WORLD'S WATCH OVER TIME

## NSTRUCT YOU IN CHOOSING YOUR WA

The buying of a watch is an important matter. It is an investment in time-keeping. And time is the most valuable possession of man.

Very few people know anything about watches.

The "works," or mechanism, of a watch is a mystery. Yet we can truthfully say, "A watch is only as good as its works."

You buy a watch for one thing—to keep correct time for you-to tell it to you with dependability any moment of the day or night.

A good watch must have something more than good looks—it must have good "works."

Millions of people imagine that the "best" watch is made abroad - or, at any rate, that its works are imported from there.

Yet, in competitive horological tests at the world's great Expositions, Waltham has not only defeated these watches of foreign origin, but all other watches as well.

In a series of advertisements we are going to show Americans that there is a watch built in the United States whose timekeeping mechanism is superior to that of the foreign-built watch, -

A watch that is easily and reasonably repaired because its parts are standardized.—

A watch that represents American leadership in mechanical skill.-

A watch that has revolutionized the art of watch making and assured accurate and dependable time-keeping.

In this important series of advertisements we are going to take you through the "works" of a Waltham watch; lay bare those hidden superiorities which have led the horological experts of the greatest nations of five continents to choose Waltham as the watch for the use of their government railroads.

We are going to strip away theory and show you facts-every part from the frame to the dial, hands and case.

When you finish reading these advertisements, which will appear regularly in the leading periodicals and magazines, you will walk up to your jeweler's counter and demand the watch you want - because you will know how it is built and why it is superior to the foreign watch.

Look for these advertisements. Read them.

E-WORLD'S WATCH

#### Mechanical Equipment of the Farm

Latest developments in agricultural muchinery and practical suggestions for the farmer

C inducted by HARRY C RAMSOWER Professor of Agricultural Engineering Obio Suns University

#### A Lantern that Burns Gasoline

A MOS useful and with deconomical lauters we shown in the accompanying photograph. This lauters have good the country present. The bask is filled about three-fourths full of good but and the is by means of a common hand beyel minup air is freed into the bowl until a present of some ten to thereby similar is preduced. The full is hardened in a manthe future. Possenga from the bowl to the bunner of the same from the howl to the bunner of the full is and vaporared. This tube is not lauted by an already of the full into the full into the same futured by an already to the full into the fu

contrived which had been a generating time summers, the first part of the pressure of 16 puttink the latter will devine 147 candle-power and will burn for 25 hours on one gallon of fuel. The efficiency of the light varies greatly with the pressure Its interform, necessary to keep the pressure as high as possible. Air should be charged into the bowl every few hours or at least every time the instern is used. I be fiame can be turned down quite low in this particular lating. It as also provided with a channing leaver which many the control of 
Of course the lantern cannot be roughly handled for fear of breaking the mun-

fear of breaking the mustice. It can though be safely carried about and being provided with a mas globe wind does not affect it It is especially desirable for use in dairy bears and is widely used by dairymen. When hung in the center of a barn it sheds a splendid light into all corners. It is not necessary to move it about as it he case with the common kerosone, wick laintern.

#### Official List of Farm Tractors

IN connection with the annual Farmers Week activities at the Ohio State linuversity the the Ohio State linuversity the Ohio State linuversity the Ohio State linuversity that the Ohio State linuversity of the Oh

necessary adjustments to put the motor in good running order. The load was gradually increased while the motor was warming

At the close of this 30-minute period the motor was adjusted to run at a speed as close to its rated r p m as could be secured and at the same time the brake was at justed so as to give the tractor its raid load. A one-hour fuel economy test was then run.

The motor fuel line was disconnected and connections made to a tank resting on a delecate scale. All tractors used fuel from the same source. At intervals of 10 minutes, fuel weighings were made while at the same intervals the speed of the motor was taken. This made it possible through the several intervals to check the



constancy of fuel consumption as well as the emciancy of the motor governor

At the close of the one-hour test the motor was given all the load that it could pull with the operator given permission to increase the speed if he as desired and was able to do so. The maximum load was pulled for 30 minutes.

minutes

The accompanying table shows in detail the results of
the tests Many interesting observations can be made
by studying the figures here shown

by studying the figures here shown

Of the twenty-three tractors tested five had twooyinder motors. The two machines gruing the lowest
tiel cost per horse-power hour were both two-oyinder types and both burned kerosane. The average fuel four
types and both burned kerosane. The average fuel four
the average of all four-cylinder motors hours.

Reference of 0.45 cant. This would mean a difference in cost in favor of the two-cylinder type of 9 cessis per
the one of the four-cylinder motors made very powerhour with the motor developing 20 horse-power. However, some of the four-cylinder motors made very power
test and if the best lester on this type of motor are
test and the basel teste on this type of motor are
ference is only 0.69 cent or, an amount equal to only
18 cents per hour for a motor pulling 20 horse-power.

Is should be remembered, though, that the burning of
keroence gives rate to some difficulties in motor operation
and that fuel economy is not the only consideration.

Asother native afford-

Another matter afforming an interesting comparison as that showing his comparison as that showing the comparison as that showing the comparison are considered in the comparison of these beautiful that the comparison of the compa

Seven of the tractors for one reason or another failed to gull their rated loads With some the adjustments were daundedly off—in one case

Incandescent mantle Battern that is very convenient for farm use

The Official Results of Farmers Week Tractor Tests

|         | Conducted by the Department of Agricultural Engineering Ohio State University January 27 to \$1 1919 |     |     |          |     |      |     |       |       |     |     |      |    |                |    |     |    |      |       |   |    |     |         |       |                                                            |
|---------|------------------------------------------------------------------------------------------------------|-----|-----|----------|-----|------|-----|-------|-------|-----|-----|------|----|----------------|----|-----|----|------|-------|---|----|-----|---------|-------|------------------------------------------------------------|
| Tractal |                                                                                                      | 1   |     | 1        |     | i    | L   | É     |       |     | 1   | 2    | 1  | P <sub>m</sub> | 1  | 1   | ١. | 1    | E     |   | ď  |     | S Trees | 11    | REMARKS                                                    |
| l ī     | T                                                                                                    | ĸ   | 18  | Withdrew | 7   | _    | Г   | -     |       | i   | _   | _    | Γ  |                | T  | -   | 1  |      |       | - | _  |     | 1       | _     |                                                            |
| 2       | Ì                                                                                                    | v   | 18  | 4 Cyl V  | 11  | 84   | 5   | 1 640 | 1 570 | 20  | 80  | Gas  |    | 919            | 3  | 78  | 39 | 75   | 1 772 |   | 89 | 7+  | 188     | 210   | Motor speed increased for maxi                             |
| ١,      | þ                                                                                                    | 1   | 22  | 4 Cyl    | ŀ   |      | 5   | 1 000 | 1 122 | 21  | 40  | Kero |    | 885            | 1  | 77  | 31 | 40   | 1 122 |   | 4  | 72- | 120     | 212   | Motor speed increased under con-                           |
| ۱,      | ŀ                                                                                                    | 2   | JI) | 4 Cyl    | 1,  | 116  | 534 | 1 400 | 1 840 | 19  | 20  | Gas  | ļ  | 956            | 3  | 92  | 19 | 20   | 1 340 |   | 4  | 00- | 110     | 185 ( | Trouble lining up to brake and                             |
| 5       | 1                                                                                                    | 2   | 30  | 4 Cyl    | 1   | W    | 5   | 900   | 882   | 30  | 50  | Kere | 1  | 097            | 2. | 194 | 34 | 70   | 884   |   | 23 | 8+  | 120     | 214   | helding tractor in line<br>Motor had reserve power at same |
| 6       | ١,                                                                                                   | 5   | 27  | 4 Cyl    | I.  | 14   | 6   | 900   | 862 / | 27  | 60  | Karo | 1  | 623            | ١, | 886 | 27 | 60   | 862   | 5 | ,  | 2+  | 120     | 212   | Added water to radiator                                    |
| 7       | l.                                                                                                   | 0-  | 18  | 4 Cyl    | - 1 | 332  |     | 1 050 | 1 125 | lio | 80  | Kero |    | 867            | Į, | 784 | 10 | 80   | 1 12  | Ī | 10 | 0+  | 100     | 190   | Motor speed 75 above normal.                               |
| 8       | l,                                                                                                   |     | 25  | 101      | - 1 |      |     | 850   |       | 10  | 20  | Kern |    | 799            | ì  |     | 1  |      |       |   | 23 | 2-  | 140     | 312   | Motor speed gradually decreased                            |
| ľ       | 1                                                                                                    | 5   | - 1 | 4 ( v)   | - L |      | 5%  | 850   |       | 1   | - 1 |      | i  | 7084           | ľ  |     | ł  |      | 911   | 1 | 1  | -   | 1       | 184   | during test Rated load not pulled                          |
| 10      | Ŧ.                                                                                                   | 2   | - 1 | 4 Cy1    | - 1 | 14   |     | 450   |       | 1   |     | Kero | 1  | 809            | 1" | -   | 1  |      | 488   | ٥ | n. | 8   | 1       | 212   | Not able to pull reted load                                |
|         | 1                                                                                                    |     | - 1 |          | - 1 | -    | 1 1 |       |       | 1   | - 1 |      | i  |                | 1  |     | 1  | 1    |       | П |    |     | 1       |       |                                                            |
| 11      | 1                                                                                                    | 0   |     | 2 Cyl    | 16  | 336  | 8   | 500   |       | 1   |     | Kero | ı  | 7824           |    |     | 1  | - 10 | 500   | П |    |     | 1       | 210   | Speed varied only 416 rev during                           |
| 13      | Г                                                                                                    | 2   | - 1 | 4 Cyl    | ľ   | ٠    | 8   | 900   | 9.00  | 20  | 5   | Kero |    | 916            | 1  | 883 | 21 | 4    | 910   | И | 7  | 0+  | 110     | 200   | Showed small reserve at same                               |
| 13      | 1                                                                                                    | 2   | 20  | 3 CM     | 1   | ,    | 8   | 560   | 557 8 | 20  | ٥   | Kero | 1  | 7715           | ı  | 548 | 25 | 3    | 945   | 1 | 27 | 5+  | 180     |       | Showed reserve at slight increase                          |
| 14      | ı                                                                                                    | 80  | ١   | 2 Cyl    | e   | 14   | 7   | 750   | 882   | 80  | 8   | Kero | ĺ  | 7522           | 1  | 504 | 87 | 5    | 788   | Н | 25 | 0+  |         |       | Speed fluctuated Water adjust                              |
| 18      | 2                                                                                                    | 0-  | 10  | 4 Cyl    | 1   | 34   | 7   | 825   | 840   | 88  | ٥   | Kero | 1  | 270            | 2  | 540 | 33 | 6    | 840   | ı | 16 | 0   |         | 177   | Motor not able to pull rated                               |
| 16      | þ                                                                                                    | 2   | 25  | 2 Cyl    |     | 134  | 7   | 750   | 733   | 21  | ا د | Kero |    | 791            | 1  | 881 | 21 | 2    | 733   |   | 15 | 2   | 120     | 166   | Motor not able to pull rated                               |
| 17      | ŀ                                                                                                    | 5   | 10  | 4 Cyl    |     | ,    | 04  | 900   | 910 8 | 30  | 3   | Kero | 1  | 106            | 2  | 212 | 33 | 4    | 900   | 1 | 11 | 38+ | 180     | 170   | Motor meed varied only 734 rev                             |
| 18      | 1                                                                                                    | 2 . | 25  | 4 Cyl    | -   |      | 6   | 900   | 998   | 24  | 5   | Kero | 1  | 8167           | ı  | 688 | 25 | us   | 940   | 1 | 0  | 12+ | 190     | 173   | during test.<br>Motor speed incressed gradually            |
| 19      | 1                                                                                                    | 2   | 25  | 4 Cyl    | 1   | . '  | 0   | 900   | ARD   | 14  | ۰۱  | Rero | l. | 719            | s  | 438 | 14 | 4    | 889   | 1 | 42 | 4 - | 104     | 203   | during test<br>Rear bearing of motor ran hot               |
| 20      | lı                                                                                                   | 2   | 2.  | 4 Cvt    | 1   | . 14 | 594 | 1 000 | 1 087 | 26  | ا . | Kero |    | 976            | ı  | 982 | 28 | 8    | 1 036 | d | 18 | 2+  | 160     | 179   | Cam shaft badly timed                                      |
| 21      | ľ                                                                                                    | 0   | 18  | 4 Cyl    | - 1 | -    | 346 | 1     | 1 130 | 18  | - 3 | 0    | 1  |                |    | 937 | 18 | 55   | 1 130 |   |    | 08+ |         |       | Tractor mar wheels raised 8 in to                          |
| 1,1     | 1                                                                                                    | ,   | - 1 | 4 Cyl    | - ( | 514  | 100 | 878   |       |     |     | Kero |    |                | 1  | 160 |    |      | 585   |   | 16 | 6+  |         |       | allow belt over front axis                                 |
| 25      | Ì,                                                                                                   | 2   | 24  | 4 Cyl    | 1   |      | 6   | 1 000 |       | 1   | - 1 |      | 1  | 869            | ı  | 788 | 24 | 85   | 985   | 5 | 3  | 5+  |         |       | Mot r speed decreased during test                          |

Kerosene 18 5e gal or 2 Ge p lb. Gasoline 25 5e gal or 4 0fe a lb



A motor cultivator drawing a grain blinder

#### Another Use for the Motor Cultivator

THE motor cultivator is, quite naturally, I used on farms growner a large screege of core, but, eva as, the surper the number of core, but, eva as, the surper the number of core, but, eva as, the surper the number of core and the surper of 
# Being a thousand times



N a great quiet room of the Billings & Spencer plant, row upon row of master craftsmen give the best there is in them to a work as delicate as fine watchmaking.

They are cutting, with lifetime trained fingers, the shapes of the forgings in great blocks of solid steel.

They are making the master dies, and no matter how long the task may take, the only requirement is absolute accuracy—absolute compliance with specifications.

For when that die is gripped in the ram of a great drop hammer—when it falls with crashing weight upon the bars of white-hot steel—forgings take shape which duplicate that die to the hair's breadth of an inch. The die cutter is right, not once, but a thousand times.

So it is with the men to whom fourteen-foot hammers are pliant servants—and the men who for a lifetime have studied steel—and the men who do nothing all day long but temper dies—their only goal is that the Triangle B forging shall be right, not once, but always.

This company is the first commercial drop forging plant in America

When Abraham Lincoln entrusted to C. E. Billings the forging of the pistols of the Black Horse Cavalry, he made possible the beginning of that iong and homorable record which has culminated in the great Billings & Spencer plant of today "Into every forging goes our entire reputation." That is the Billings & Spencer creed.



The

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#### Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

#### An Overhead Cable Track Supported from Both Sides

SOMI FIMES a discovery or invention ten be spoken of as lawing solved the problem of this or that Sometimes on the other hand the inventor succeeds in doing something which prior to his disclosure would have been conceded by everyone to be impossible—something which appeared so obviously out of the question that nobody would ever have quest in that nobody would ever have thought of trying it—something in con-nection with which therefore the exist ence of a problem to be solved would never have been two massed. There have been two ways of running

in constant contact with an overhead wire whi h is sufficiently long to require support at other points than its ends One is seen in the ordinary trolley wheel one is seen in the ordinary roney when where the wire is sufficiently undersiting from its supports to permit a more or leas deeply groved wheel to run in turn under it. The other may be found in various places where a carrier of one vanous places where a carrier of one sort or another is run asspended from a catle it consists in supporting the cable from one side only, on the end of a bracket and in hanging the ear from the cable by means of an outcurving trues which passes around and over the war on its free, side to engage a trilley which above the wire. Of course if there is any material weight to be carried thi procedure involves two wires supported from their opposite and outer sides so that the carrier may itself be supported from some seek side.

A New York inventor has recently put out a device which makes it possible to run a carriage suspended from wheels along a cable that is supported from both along a casic that is supported from both as apparent impossibility has been brought about and the car enabled to pass the supports of the cable is indicated in our cut it will be noted that the member connecting the two traction wheels is traversed on either side by a grooved track in the shape of a circular are and trace in the snape or a circular are and that the carriage is suspended by means of a toothed circular wheel of correspond ing radius. The teeth of this wheel are the things that reveal the servet of how to do the impossible. Open at the ends each tooth engages the circular track on both sides of the wheel truck Until a support is encountered the sus



The carrier that passes the supports of a cable way when these appear to block all passage

own but as soon as it ancounters the barner offered by one of the supperters, it is forced to rotate Then, it is a monkey on a stock, it climbs around the supporter and emerges safely on the offer-side never losing its grip on the groored

a series of bars suspended a foot or so beneath his ladder. If this were pro-posed as a problem, we should at once picture how the performer was going to slip under each obstruction with one hand gripping the last rung of the ladder



Diagram of the centrolling screw and rack of the high-pressure redu

track In fact, at all stages of operation at least three of the teeth are engaged with this track

Perhaps it would be even more to the point to compare the operation of this elegant little device to a gymnast, per-forming on the flying ladder, and passing

and another reaching for the next inventor has given us a most elegant mechanical version of this action

The use of this device it is predicted, will effect consider-

able saving, masmuch as cable
ways which must now be

sufficiently substantial in constru-be supported from one side can much more lightly for symmetry part. The invention should be zoular value in min can stradgle the man-pasy to lay the pipe to position with a single general, it should great in transfer in both as

#### High-Pressure Hydrant Regulation By C. W. Gelger

O'N the morning of April 18th, 1908, a severe sarthquarks was experienced along the California coast. The shock broke the water mains leading into San Franceso from San Matso Country, leaving no ready means of defense against the several small first stated by wirms shat had become crossed during the brief award of wheater. For these day the anat and become crossed during the brief period of vibration. For three day the confingration raged, destroying property valued at over \$300,009,000. To mark against a repetition of this experience, an

against a repetition of this experience, as auxiliary water-supply system for fire protection was matalled. The area this square mide. Due to the city's irregular square mide. Due to the city's irregular topography it was necessary, in order to topography it was necessary, in order to topography it was necessary, in order to high and low fying distenses, to divide the proposed treas into two rooses, cash supplied from a separate and indepations:

supplied from a separate and independent receiver. Both nones, however, can be connected to the main supply reserved: Those two reservois supply waker at an average pressure of 160 pounds to the hydrants in abler respective somes. By cutting the lower sone into the receiver's normally supplying the higher portion of the city, an average pressure of 210 pounds can be obtained at the hydrants in the former. This showing can be equalled in the higher distincts by connecting the supply mains there directly with the main storage reserved; which has an altitude of 760 feet. Finally, an average pressure of 300 pounds and a which has an attitude of 760 feet. Finally, an averlage pressure of 300 pounds and a maximum of 329 pounds can be got in the lower sons by similarly utilizing the direct head of the main reserveir. Installed primarily to control another quake emergency, should such ever arise, this installation obviously cannot sociously cannot sociously control another than installation obviously cannot sociously control another than installation obviously cannot sociously control and present the second of the second



The newly designed reduction nomic for San Francisco's high-presence hydrenic. At left and right, externel and sectional views of the meeting of the hydrani





# "Your Nose Knows"

All smoking tobaccos use some flavoring. The Encyclopaedia Britannica says about the manufacture of smoking tobacco, "...on the Continent and in America certain 'sauces' are employed... the use of the 'sauces' is to improve the flavour and burning qualities of the leaves." Tuxedo uses chocolate—the purest, most wholesome and delicious of all flavorings! Everybody likes chocolate—we all know that chocolate added to anything as a flavoring always makes that thing still more enjoyable.

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American Substitutes for Bexwood (Continued from page 288)

ciontly large trees of witch hard, great rhododendron, and mountain laural san undoubtedly be found in the southern

Among conserous woods there as non-Among connectors would be made as my very fine text red species which are almost homogeneous in appearance and are

nimost homogeneous in appearance and age hard enough to take a good poish Yellow cedar which grows along the coast from Alaska to southern Washington and in the Cascade mountains southward nic Oregon is one of the finest textured onifers. Its wood has a clear yellowish dor and a distinct spicy odor, and is well constars

itted for novelties
Pinon one of the nut pines of the Southwest is the hardest and heaviest of the soft pines and has a very uniform struc-ture. The heartwood is yellowish or creamy brown in appearance. Although this species would not do for engraying purposes it apparently would be excellent for cheaper grades of chesemen, for it

Other very fine textured conserous woods are the Arisons cypresses, the juniwoods are the Arisona cypresses, the jun-pers or red cedars and the western yaw The wood of the latter two species, how-ever is dark reddish brown in color an rather brittle and therefore, could not be used as an imitation of boxwood, although its uniform fine structure makes an even

Although none of the woods above incutoned has all the properties of true boxwood the scarcity of this species makes their substitution in many cases justifiable

#### Reconstruction in Europe (Continued from page \$98)

2 000 individuals temporarily brought to-gether at a concentration or demobilisation camp is quite another

England is considering her problem both as applied to her huge army and her very largely increased navy under a num-ber of different heads—it will be impose ner of unferent heads—it will be impos-sible to go into all of them in detail, but their titles are sufficiently indicative of the points of view from which the problem has been attacked

First of course comes the creation of military machinery for the demobilisa-tion itself—in itself no mean task. Next comes the vital question of transportashould be noted here that one of the limting fact its in speed in England, may well be the available wharves and docks which can be spared from commerce to berth the ships which carry troops England faces also the organisation of a new arm) her regulars of 1914 being pracwas incapacitated, or so scattered in the expansion of the present army as to make impossible their becoming even a nucleus of what army she will retain. The are of those unfit for on'll life—the wounded, the mutilés the helpless the I had the gassed the ones who are runed in health from privation, exposuret or (rerman prison camps is a very vital matter in her demobilisation scheme Storage in her demobilisation scheme Storage of arais, ammunition, equipment, ordnace, against any future disposition must be arranged before the materiel can be abandoned by the men who now have it in charge—naturally the millions of pounds sterling invested in material must not be thrown away even if demobilisation of the thrown away even if demobilisation of the man power caring for it is slowed up, for the taxpaver must be considered as well as the fighting man With this problem comes the disposition of animals, vahidas, stores food Net until these matters they been taken care of can the nation believe adequately prepared to handle the effic-

and finally horrible thought though it may seen to the altrurate, adequate plans for remobilization, without which not a wheel is turned in England's demobilization

It should not be understood by this that Great Britain expects another war, or is planning for one. But it would be futile to store cannon and ammunition or dock how unnecessary warships instead of sinking them if no plans were made to man them should the need over arise, and while the belief is universal in England that the war is over, that Germany is defeated for all time, and that the peace to be concluded to be a lasting peace, nevertheless, like the wise traveler in desert piaces, she lays in a supply against the time of need, not-withstanding that she is "fed up with war and all that appartains to war The United States has the same idea, for our draft machinery and our registration records are such as to enable us to remobilise if not with a 'million men over-night as one prominent Chautauquan has many as one prominent Chautauquan has expressed it at least with a speed beyond anything we have ever been able to attain before

The order and method of British de mobilisation begins, of course, with the sick, wounded multilated and war prisoners as soon as they have been restored to the as soon as they have been restored to the best possible physical and mental condition regardless of any other consideration affecting priority of release from service Thus a wounded man in hospital can look forward to immediate demobilisation as soon as he is physically fit, even though he

Next comes demobilisation of men called Demobilizers,' that is, those men required in either a military or a civil capacity for the work of demobilizacapacity for the work of demobilisa-tion—the men, in other words who will form the demobilisation machine. They will be followed by what are called pivotal men, largely skilled artisans absolutely required in certain industries before such can be redstablished, men who will thus he there exactly men before such that the present was heartistics. will thus by their speedy reabsorption, be able to assist industry to absorb other workers beel testers, chemists stand-ardisation experts, designers, technical engineers are cases in point. But in order to avoid even the appearance of unfairness the numbers of men in both those classes will be limited in the extreme and only

who have some definite They are those who have some definite work awaiting them who know exactly what they are going to do and where they are going to do it. They will be released in the order of the priority of their in

dustrial groups Fourth

comes those who have not jobs Fourth comes those who have not jobs awaiting them but whose trade or other employment in civil life is of such a character as to be of high importance is national reconstruction and who will probably have no difficulty in getting work immediately Such mea might be ship workers (oal miners steel tool mechanics

Fifth come the other "non-slip" mer who have no definite employment read; and waiting for them, who will be de mobilised in the order of their importance to civil life and finally the men selecte to form the eadres or skeleton units of military bodies necessarily left out of the general scheme of demobilisation to care for horses, guns, materiel, etc. as long as

such care may be needed

Within this general scheme comes the
preferential device to take care of married
men and men who have served the greatest length of time at the front, as well as sengen of time at the front, as wan as tune-sexpired soldiers and sailors who results and for the war. Within each group as it is demobilised preference will go to the matricel over the single, the long service over the short the regulisted soldier or sailor over the man who has not pre-

debandment of military units, repairance of attempting to get jobs for all her soldiers military units, repairance of attempting to get jobs for all her soldiers military units, repairation of pressures.

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#### PATENTS

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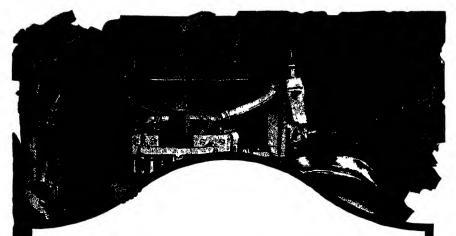
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## Wisconsin

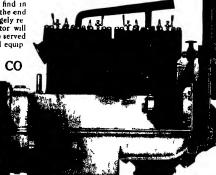
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## Reconstruction in Europe (Continued from page 200) and sailors who do not have them yet

Recomment maintenance (Consequence primary stems) and sallors who do sto have them randy and a sallors who do sto have them randy and waiting and the Minaraty of Labors and waiting and the Minaraty of Labors are very different from that of our own Department of Labors, by which focal as the continued as a stacked on any term of the continued of Labors, by which focal as the continued for industry by traded unions and particular industries, by which plant in the continued fluid of t England is working in Figland—and the educational opportunity to be afforded men during demobilisation delays is but the opening gun in this campaign

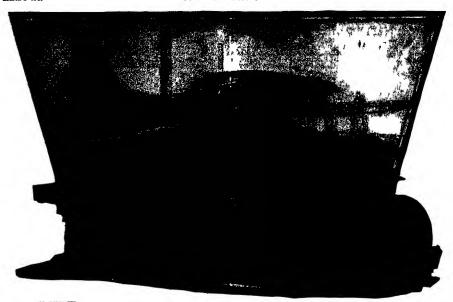
#### Official List of Farm Tractors (Continued from page 232)

the valves were improperly timed Thas was mercusable What if the machine had gone out into some farmer shands in that condition? Thas failure to make good the guarantee of the inakers should stand as a evere indictant against the all too common practice of over-rating

Prospective purchasers should be very Prospective purchasers anomal be very careful in the purchase of new and un-tried machines to make sure that the machine has undergone some sort of official test in the hands of unbiased parties. The farmer cannot afford to run experiments at his own expense

High-Pressure Hydrant Regulation
By C. W. Geiger
Gousseaf from page 144)
nonically be allowed to stand in idlenes, swatting another distrophic upbeaval, it should be freely employed as an aid desired to reduce the standard to the regular freedings system. But it should be freely employed as an aid of the core turned to 200 populés is in to the registe freedings system. But the core turned to 200 populés is in the controlling the pressure Turnag astream of water against a building at any such spreasure are 300 pounds would be more controlling the pressure Turnag astream of water against a building at any such spreasure are 300 pounds would be more likely to wipe out the building than the dark of the consequently the high pressure was employed but seldem, out of a tract of 3,100 frem in 1917 to came into action in woly 35 cesses. Yet the great total of 3,100 frem in 1917 to came into action in woly 35 cesses. Yet the great total of 3,100 frem in 1917 to came into action in woly 35 cesses. Yet the great total of 3,100 frem in 1917 to came into action in woly 35 cesses. Yet the great in the color disturbed by merving the control in the color of the production of the color o

A cock connected with chamber C, when open, permits the water to run out into the atmosphere, reducing the pressure in this chamber. When this occurs, the combined pressure in A and B will force the valve to its east at E, sutting off the pressure in A and B will force the valve to its east at E, hence there is a greater total force operating at D than at E, and the valve is held firmly against its east. This necessarily is a pressure that the pressure is a properly about by the fact that in chamber E, a quarter inch of the variese on each adde quarter inch of the variese on each not pressure area is four inches in deameter. pressure area is four inches in channeter when the valve is open and only 3½ inches when closed Once closed, the valve can only be opened by closing the cock in channer C, which will equalise matters again and lift the valve from its seat,



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while attention has always been directed to incthods of recovering the tin from scrap the importance of such operations has been greatly enhanced and they have been in lertaken on a scale never before

approul

The pr blem of recovery does not at first appear to be a difficult one, and it was bound to appeal to the inventor, for the cut fact mes were glad to give away their rap for the asking, or even to go so far as pay to have it carried away. But in it of the many avenues of attack st t of the many avenues of attack study and experiment before a feasible valuable results to make it a paying proposition

All the processes which have ever actually uperated may be divided into three general classes—mechanical chemical and electro chemical—In the mechanical procmeal chemical and ess the effort was made to separate the tin from the iron by means of heat or, more rrom the fron by incans of test or, more recently by refrigerator Little success has attended such procedure however, mainly because the methods seem funds mentally unadapted to obtain a thorough separation

Most chemical and electro-chemical processes have also failed either because the acids used attacked the iron as well as the actor used actuaced the iron as well as the tin or because they would not dis-solve the tin sufficiently and left consider-able adhering to the iron. In many instances also the chemicals employed were too expensive to make the processualid one financially. Three process owever, have operated successfully for the past 40 years being more or less in competition with one another and alternating in temporary preponderance as now one now another, benefitted from further refinements

The exceedingly simple idea of electrolysis of tin scrap in an alkali solution inof considerable magnitude, but these have all been met at one time or another The process requires the greatest of watchful care, but since the tin is received at the care, nut since with a spongy or finely granulated precipitate which may easily be removed and melted, it offers son spicuous advantages. The case with which the tine and iron may both be utilized when once they have been successfully separated by this process gave it the lead-ing position in the field up to about 1907 When dry chlorine is brought in contact with tin clippings, the chlorine and tin will combine and the anhydrous tetra chloride of tin which is formed will drip off As chlorine at low temperatures off As eniotine at low emperatures does not attack ron, we have here what looks like a promising line of attack. But enitroil of the chlorine gas and of the tin chloride fumes is difficult and workmen are annoyed if not actually endangered then too, all humidity must be oxcluded Inen too, an number was to excuse upon the iron while there must be complete freedom from organic materials such as paper straw varnah, etc, and finally means must be found to keep the apparatus below the temperature at which the chloride would attack the iron Since 1907 the German pioneers in the detinning industry have found a way of meeting all these conditions however, and of carrying out the operations under a varying pressure so that the chlorine is forced into every part of the mass of tinned scrap, and accord-ingly the electrical detunning has largely ingly the electrical detunning has largely been abandoned in favor of this method A conspicuous advantage is the large

Within very recent years there has been within very recent years there has over a tendency to return to the alkah treat-ment which is instorically the oldest of all. The scrap is cleaned carefully and placed in a well-heated solution containing a considerable excess of free alkah and salt-

Recovery of Tin from Tin-Plate Scrap peter or other oxidizer. After boiling, Ab the war has progressed the price riamant of sods forms in crystals, which to fit the advanced to levels baselosifur. Hought impossible Accordingly, the solid progressible Accordingly, the solid progressible Accordingly, the solid while attention has always been directed. then extracted from its connection with the soda while the alkali itself and the saltthe some wante the attain their and the salf-poter are recovered for use again and again, with little loss. The fact that the process is a circular one is the advantage which has led to its recent extensive reintroduction

#### Toluol and the Gas Industries

THE importance of high explosives in the war has been amply demonstrated Nearly all types of explosives are used in some way but trinstrotolool because of high power and great stability is one of the preferred members of the class. It is used alone and in combination with other explosives especially for naval use it is used slone It ause its great stability permits unusually long storage of the shells before use On account of the great demand thus a tiel there has grown up also a large thus it uter there materials from which demand for those materials from which it is mad and especially for toluol. This latter sul stance finds numerous applica-tions in the chemical industries but above all else it is used in the manufacture of

Although toluol occurs in coal tar and is comin it is spoken of as a coultar product there is really to be found in the tar only a small percentage of the total toluci originally distilled from the coal Most of this constituent remains in the gas. This toluol together with bensol the xylols and toluol togeliles with bensol the xylols and other related hydrocarbons can be re-moved from the gas affording what is known in its crude state as light oil. This light oil has not heretofore usually been removed from coke-oven or city-gas sup-plies because of the relatively simall com-mercial domand for its constituents. The process for removal was well known how-ever the prin ipal one being the washing of the gas with a petroleum oil in which they were subsequently recovered by distillation

Privious to the declaration of war in 1914 the production of toluol in the United States did not exceed 500 000 to 750 000 gallous per year Most of this came from coal tar distillation but smaller amounts were prepared by refining the light oils removed from cok oven ga few plants At once after hostilities opened the demand for toluol increased greatly and it became evident that the common sources of this material would not meet the new commercial demands. As a meet the new commercial demands. As a consequence a large increase in the recov-ery of toluol from coke-oven gas immedi ately followed and more recently the recovery of this constituent from city gas supplies has also resulted

To give an approximate idea of the scope of the industry thus developed one need only compare the small output of pure toluol in 1912 and 1913 for which years it was approximately 500 000 gallons, with it was approximately 500 000 gallois, with the estimated output for the year just past (1918), during which period it is hoped that the output will have exceeded 20,000,-000 gallois Practically all of the increase has been possible because of the recovery of toluol from coke-oven gas and

supplies he removal of toluci, bensol and other light oils from the gas eauses a reduction in both the heating and the lighting value of the gas. Therefore city gas plants which are required to maintain certain qualities of product have found it necessary to counder the influence of this by-product. industry upon their operating practice in order that the recovery of the constituin order that the recovery of the constitu-ents in question may not reduce the quality of the gas supplied by them below the legal standard. In some case changes in operation practice are possible in others resumed, and the proposal of the others resumed to the proposal of the light of the beautiful of the proposal of the in thill other cases modification of stand-ards has been found desirable, especially (Continued on page 229)



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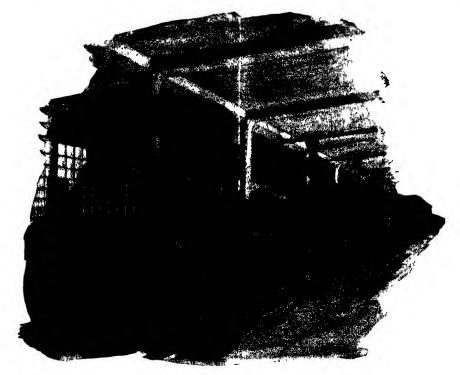
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#### Toluci and the Gas Industries

(Continued from page \$40)

in the matter of candle-power; this mines of mantles over illuminating jets best

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more and more widespread

The Bureau of Standards has found that this entire development comes within the scope of its activities and has kept its finger continually on the pulse of the tolkid and gas industries. From time to time it has published reports and papers on onaspect or another of the situation, and it crystalized to make possible the publication of what for the present at least ranks as a final summary of the procedures for recovery of toluol from gas. This paper is available for distribution to those interested and may be had from the Bursau in Washington It should be applied for under the title 'Technologic Paper No 117, Toluol Recovery

#### Emigration After the War

A MONG the economic questions which will become more important as peace comes nearer is undoubtedly that of emigration There will be a gr for labor to rebuild all that which has been destroyed even after the armies of millions have been demobilised and returned to productive work, and at the same time the trans oceanic countries need of immigra-

tion which during the war has almost stopped will be reawakened with renewed strength There will be a strong drawing on the neutral countries especially, which have been spared their populations, and t is therefore necessary for these country to take timely measures to prevent such harmful results according to the Seensk Handelstiding of Stockholm Sweden

The Dutch press has given a summary of easures already taken in this direction by the neutrals as well as the warring countries In May there was started in (comany the Reichsstelle fur deutsche Auswanderung und Ruckwanderung to work for the return of Germans from foreign countries and at the same time to guard and replace their former properties In England the Government has already started to make plans for the returning soldiers and their families in Canada Australia New Zealand and South Africa (anada Australia and New Zealand have siready placed great tracts of land at their disposal and so his South Africa, on a smaller scale lengland has submitted an emigration law for second reading. It works against emigration of labor from I agland to other countries and also provides for certain restrictions on emigration to the columns

In Switzerland is the Auswanderungsamt which controls the work of emigra-tion promoters. Austria Hungary like Germany counts on the return emigration Opinions have been expressed in favor of giving them land maximuch as most of the emigrants from Austria-Hungary have been

Italy can probably count on a balance labor | the former seasonal emigration of land laborers to surrounding countries, on which a large economic profit has been based will presumably be resumed. Considering the great war losses there will surely be a few years halt in the former large enugration to North and So

Because of the present good relations between Italy and France it is quite possible that France will be fortunate to receive the seasonal emigration of Italian land laborers. The I rench emigration was not large before the war. On the was not large betor the war On the contrary there was considerable emigra-tion to brance from Italy, Spain, and Belgium Regarding Belgium, there will undoubtedly be a strong check against emigration from that country, inserench as no country will be in as great need of man power as Belgium

On the northern European confidence

by the other European countries which will need a maximum of skilled labor but whi need a maximum of same into but also by America, where extensive estab-fishments have already been started for the purpose of encouraging immigration, concludes this Swedish contemporary

#### Shipping Subway Cars a Thousand Miles on Their Own Wheels

T is used to be the practice to ship elecars intended for metropolitan railways, on b waiting for it

job watting for it.

So when it came to shipping the subway
cars intended for New York city a new
subways the expedient of shipping these
cars on their own wheels over a distance of
one thousand miles was resorted to. Out of 477 subway motor cars 307 motors and 140 trailer (ars were shipped from the car building plant near Chicago, to New York city Later 30 cars were also sent in the same manner When these cars were

the same manner When these cars wer ready for shipment, inspection was made by the subway s inspection department In shipping the subway cars, they were first assembled in units of five, and M C B

first assembled in units of five, and M C B drawbar had and steps and grab handles were installed on the first and last care of each unit in compliance with the Interstate Commerce Commession a ruling All ears were capupod with special brake ragging autable for shipping behind standard steam and the compliance with a special consistency of the compliance of the complian that in case of a breakdown, a five-car unit tent in case of a oreaction, a process mine could be dropped off at any terminal if temporary repairs could not be made The side tracked unit could then be atsached at the rear end of the next shipment

Thirty cars were shipped in one train from the car plant in charge of a rep tive from the subway company car contained one mattress, one pillow, and two blankets for his use For emergand two bullets for ms use for emerg-ency purposes there were earned in the last rer 25 journal brases, 10 gallons of journal oil one pail of grosse, one pail of saturated waste and one packing ron it was necessary for the messenger in charge of the train to supply himself with

rations for a period of about four days
When the subway cars were ready for Which the subway cars were ready for shipment the car builders took them to Burnside Chicago and they were thon transferred to the Belt Line Railroad of Chicago which in turn transferred them Chung which in turn transferred them to the lake Shore Radroad at South Ching There was sometimes a delay of tw lve to twenty four hours before care of the 1st to twenty our abun source can could be transferred to the Lake Shore Road loe to the blocking of the road When cars were finally turned over to

the Lake Shore Road a crew consisting of one enginer two brakemen and one conductor was called by the yardmaster to take the train to bikhart, Ind the first stop between Cheago and New York, where the cars were inspected and all journals lubra ated

At each division different crews took At their division different crews cors charge Between Chicago and Cleveland, an average speed of 20 miles per hour was maintained, while between Cleveland and New York city, the speed was 25 miles Upon arrival in New York city at the

Highbridge Yard, all cars were thoroughly inspected to see if any of them had been damaged in transit, in which case the rail-road company was held responsible

The average time from Pullman, Ill to Highbridge New York, was two to three days The distance is roughly 1 000 miles On occasion it has been necessary three on occasion is has been necessary to replace a journal brase on the road from Chuago to New York due to overheating, but as a general rule no trouble has been

our as general rise no trouble has been experienced in shapping subway carr on their own wheels over the great distance. Cars are stored at Highbridge yard until they arrive at the construction shop of New York's Interborough system. They are thou reheved of their temporary brake figure, store explained and rigging, steps, grabhandles and drawba heads, and these accessories are returned to the our builders by building

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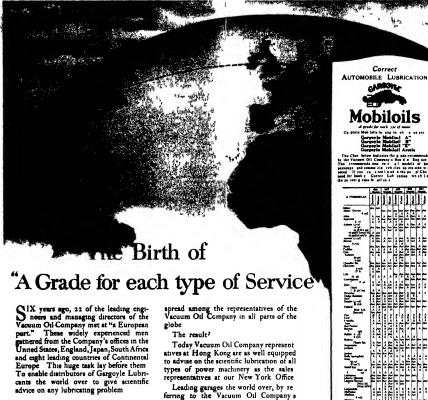
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BALDPERS. It's Causes, Its Treatment and Its Prevention. By Richard W. Mutter, M.D., AMA. New York: E. P. Student, M.D., AMA. New York: E. P. Student, M.D., AMA. Student, M. Student, and foreign authorities are incorporated in the hook, and a measure of hose is half out to these whose had in a security. The use of fight reps, which has produced some self-thing results, re-votires described attention, as indeed to all other power methods. The work is sortice; reseated and conservative in spirit, sort is reseated and conservative in spirit, sort is resulted as to the positrate themselves would be benefited by

many facts of a scientific natewe which a book of this kind need not necessarily disclose 1 is a bounding item of the kind need not necessarily disclose 1 is a bounding item of the kind need not necessarily disclose 1 is a bounding item of the kind need not necessarily disclose 1 is a new part of the kind need not necessarily disclose 1 is a new part of the kind need not necessarily disclose 1 is a new part of the kind need not need to depth miles to the high contain waters from an extend of sight miles to the high contain waters from a detecteding into Germany occurred to the kind of the high need to the high contain waters from a cannot of sight miles to the high contain waters from a cannot of the part of the water high need to the high contains and rivers comprising over 11,000 paints.

It is excompanied by an index of all the principal towns and rivers comprising over 11,000 paints.

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### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX

NEW YORK, MARCH 15 1919

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Buth Ever Bridge (traft conecity equal that of 18 tunests) combined with a fallway loop in New Jersey and Manhattan, would solve the freight and passenger problem at the Port of New York [See page 254]

### SCIENTIFIC AMERICAN

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#### Relative Efficiency of Bridge and Tunnels

MOSI persistent and curious fallacy which keeps cropping up in the discussion of the relative advantages of bridges and tunnels for the Hudson River crossing is that of the greater economy of tunnels As a matter of fact measured on the basis of carrying canacity tunnels cost a great deal more than a bridge We have no particular interest in bridges as against tunnels but we have a very particular interest in the truth and it is most unfortunate that this error should have become so deculy rooted and far spread

Any two rival systems of transportation must be judged when we are considering their cost alone, on the basis of their (apacity and since the bulk of the traffic in these days is trolley and train traffic it follows that the basis of comparison must be that of the number of tracks provided. Thus the Pennsylvania tubes leading to the 33d Street Station accommodate two tracks | The proposed North River bridge over the Hudson River will provide 14 tracks or seven times as much capacity the North River bridge will provide also wide roadways for a very heavy automobile and motor-truck

The scheme proposed by Gustav Landenthal and described the where in this issue, calls for a helt line with two crossings of the North River one by bridge and the other by tunnel and the author of the scheme who is by no means opposed to tunnel construction, estimates that the capacity of the North River budge would be equal to that of 18 separate tunnels which would cost in the aggregate 200 inilion dellars as compared with the cost of a North River bridge of equal capacity of only 75 million dollars

Another persistent though less frequently stated fallacy is that of the relatively short life of a bridge as compared with a tunnel One pronuncial citizen of New York who certainly ought to hav known better recontly stated that, whereas a tunnel is indestructable, a bridge is subject to constant and i spid deterioration so much so that within a comparatively short time every part of it would have to undergo replacement. As a matter of fact there is no reason, except that of human negligence to prevent the inhabitants of this city a thousand years from now traveling over let us say the Manhattan Bridge across the East River-not a Manhattan Bridge renewed but a Manhattan Bridge containing practically every identical ton of material, at least so far as the main elements of the bridge are conserned that xists in the structure today. All that is necessary is g ad weather proof paint, a conscientious inspection and the freeing of ongineering works in this city once and forever from the destructive blights of political interference and graft

So great is the mass of those long-span bridges that their sponsors are never worried by any theories of the so-called fatigue of metal. The proposed North River Bridge, for instance, will nover in any part of it be stressed within speaking distance of its elastic limit, and with carrful inspection and painting, the structure, once erected will stand as a supreme monument to the present age of steel construction not merely for the time of our children and grandchildren, but for uned-at centuries to com

It should be understood, of course that this perpetuity does not apply to those portions of the bridge that are ammediately subjected to direct contact with the traffic such as asphalt or plank roadways steel rails and ties But excepting those, which in the aggregate form only an insignificant portion of the mass of the bridge, the rest of the structure, with a little human care, should be as lasting as the work of those far distant engineers who piled up the pyramids of the Pharacha

#### The International Institute of Agriculture

N January 3d the cables announced the death in Rome of David Lubin the founder of the International Institute of Agriculture, located in that city Although David I ubin was an American citizen, a Californian, the brilliant constructive work done by him in the foundation establishment, and progressive development of this remarkable enterprise is ess widely known and appreciated in this country, perhaps than in Europe It was in 1905 that this vast project was initiated with the support of the King of Italy Its success is borne witness to by the fact of its rapid growth and extension to include no less than fiftysix countries among its members Its object was th creation of a world-ambracing organisation for the study of every phase of agraculture The questions involve demand the study of the most favorable conditions with respect to the production distribution and consumption, not only of bread and of most and of the cereals and the herds and flocks from which these great food staples are derived, but also of the wool the linen, the sik and the leather which furnish the clothing of mankind, of the coffee, tea, wine, eader and beer which humanity craves, and of a thousand far-flung products yielded by the bountiful earth for man a comfort, luxury, or

Included in the general problem are first the technical problems having to do with machines on the one hand and with fertilizers on the other and therefore demanding aid both from the natural sciences and the applied sciences secondly, the economic and social problem concerned in association and cooperation mutual inter change of information, credit and senstance in general, and, finally, those of the agraman policies principles, and laws current in various parts of the world

The Institute, in fact, forms a vast clearing house for the exchange of mutual information and aid with regard to agricultural matters between the 56 government which form its members and share its expenses, and no better proof can be given, perhaps, of its vigorous growth within so short a time than the fact that even the Great War was not able to shatter its structure, or notably curtail its activities. It has steadily continued to achieve its objects as stated in Article I's of its Constitution, to the effect that "The Institute confining its action to the international domain shall (a) concentrate, study and publish as soon as possible all statistical and technical or economic information concerning both animal and vegetable products in the different markets of the world (b) communicate to its members, likewise as promptly as possible, all such information, (c) present upon occasion for the approval of governments, the measures to be taken for the protection of the comm interests of agriculturists and for the betterment of the conditions under which they work and live"

The Institute is divided into bureaus or sections, which issue valuable publications including three monthly bulletins, dealing respectively with agricultural information statistics, and social and economic institutions. two annuals, relating to agricultural statistics and agricultural legislation, prefaced by a résumé of world legislation, three publications of seasonal or annual a with respect to the statistics of cereals, the food supplies for domestic snimals, and fertilizers and, finally, a periodic bibliography of agronomy and a large number of monographs upon special questions

The Institute has an annual moome of about \$180,000

including the \$60,000 grant by the King of Italy, and

the subsidies from the government sometimes. The has enabled it to obtain an admirable segritories, the chaf feature of which is its library, which consists 70,000 volumes even five years age, besides form of recent of some 2,660 papers and periodecals from all the world Its work is facilitated by the possession its own post office and its own printing establish both housed in the same palace which abelians Institute, which also contains suits of rooms for visiting delegates Since only governments are eligible as mes bers of the Institute private organisations or societies wishing to correspond with it must do so through their respective governments

#### Reconstruction and the Industrial Engineer

HEN we joined the war against Gerk aggression, two years ago, we realised that VV we were entering upon a vast manufacturing undertaking, the greatest the world had ever seen Our men in the field could only win as they were supported by the men back home in the machine of the more efficient that support the sooner would visit be achieved and the less precious blood would be shed Consequently the manufacturers of the country was called together to lend their council in building up the huge industrial organisation. The Council of National Defense, thus formed, early awoke to the fact that its membership included no industrial engineers, and also to the fact that there was no national organization of such engineers An appeal for help was sent to the Western Efficiency Society, one of the most active local societies, which was about to held its annual convention in Chicago The response to this appeal was the formstion of a national society known as the Society of Industrial Engineers

The first duty of this society was to aid the Govern ment in the tramendous industrial problems with which it was confronted and its services were of highest importance to the nation

The Society of Industrial Engineers is meeting next week in New York to study problems that have arise since the eigning of the armstice There is no doubt that the reconstruction period will make greater demands upon the services of the industrial engineer than even the period of feverish wartime menufa-During the war the one all important impelling force was production Everything had to be sacrificed for production and methods were employed which could not be used in time of peace by a commercial concern Industrial engineers had to adapt themselves to war conditions and modify their systems to conform with unusual circumstances There was some bungling and some very mefficient work on the part of novice posed as real industrial engineers. But on the whole the experience was of benefit to all parties Manufacturers learned to appreciate the services of industrial engineers They found in them real "coordinators who worked to effect real cooperation between employer and em-ployee The latter began to lose his distrust of the efficiency engineer and, to understand him better, and the industrial engineer himself learned minds about organisation and management on the one hand and the cessity of studying the requirements and interests of

the indurdual worker
On another page we publish as settlet on Industrial
Democracy and Engineering in within these experiences
of the war are discussed and the sent aims of the industrial engineer are outlined. If his aid was insided
during the war his services are over more indisplaceble
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during the war his services are over more indisplaceble
during the war his nervices are going through the ingringpented of readjustments. The public has been adjusted
to the worth of industrial angineering, and the industrial regimeer, himself, has received a most realizable
education from his caparinances in the wars, to dept he
is better fitted then swer belowe to said the anginger in
the perplocing mechanical said industrial pupilsme
which are now confronting him.

#### To Our Subsiribury.

OUR scheetbers are requested to note the sightested date that appears on the wratpens established to copies of Scatterage Assuments. If they will sight to their received orders at least two weeks point for la-dest of superation, it will said us greatly in imposition, them offsients cervise.

#### Naval and Military

"She 14-sizen "Aslincourt" Net Popular.—The Bujish battleskip "Apiacourt"—formerly the "Rio de Janebee" building for Braul and taken over by the Brijsh when the war opened—a notable for the fact that his has no less than even, two-pun turrets, mounting a total of fourteen 12-inch guns as her main battery the protection of nne laches of side armor is residered by three geotective decks, 17 main builcheads, and 305 webs-dight compartments The ship, according to The Hugsneer, is a type quite alien to British naval ideas, which run just how to fewer guns of heavier calibre, and in spitts of her formidable armsment, she is not a very popular skip.

Government to Take Over Cape God Canal —The tenerary of War, the Scowrary of the Navy, and the Scowrary of Commerce were requested to discuss the advisibility of sequinng the Cape God Cana for the Frderal Government, and they unanimously concluded that the transfer was destrable The Scowrary Own, after elaborate studies as to the value of the Canal made by the Englascing Corps of the Army, offered the Canal owners the sum of 48, 150,000, which they declined to accept Consequently, the Secretary has asked the Altornay-General to begin condemnation proceedings and report the facts to Congress It will be agreed that the strategic value of the Canal, providing a pracially continuous inside water routs from Boston to New York for paval ships, fully justifies its acquisition by the Théedral Covernment

The Navy and the Merchant Marine — Discussing the interdepadence of the navy and the merchant marine. Vioc-Admiral Albert E Gleaves recently designated the navy as the backbone of our as power and the merchant marine as its nerves and smews. He stack his belief that navy and merchant narme seamen should be paid on the same scale cared for with the same scale cared for with the same thoroughness, and subjected to the same designine. In 1914 the total merchant tonnage in the world was about 0,000,000 tons. The war, thirty through submarine prizely, destroyed 15,000,000 tons, and the new shipping constructed amounted to about 1,000,000 tons, leaving a whorage of 4,000,000 tons in ordividual displacement and totaling 30,000,000 tons. The over 1 of the first its extension of the first its marked at four billion dollars—10 times as much as the

Later Particulars of "Hush" Ships -The latest ent of dimensions regarding the so-called "hush" ships built for the British navy during the war, indicate that their dimensions, speeds, etc., as published during the war were greatly exaggerated. Thus, The Engineer gives the following dimensions for the battle-cruisers nown" and "Repulse' Length, 794 feet, beam, 90 feet; draft, 30 feet, normal displacement, 28,500 tons and for the celebrated trio "Furious," "Courageous, and "Glorsous," the dimensions given by the same authority are Length, 786 feet, beam, 81 feet, normal draft, 28 feet, and displacement, 18,600 tons After "Furnous" was changed to a seaplane carrier, auplanes had no difficulty in landing on her deck after nturning from a flight She is credited with 18 torpedo tubes and with 90,000 horse-power for a speed of 31 knote, which, we are told, was very greatly exceeded in actual service.

Listing Ships for Range.— In the annual report of the Berment of Ordonne, Admiral Earle states that the turnet machinery on the "Ministipp" has been tested and concessfully freel, with the abil plant of 1/5 degrees, which, with the guns at their manmum elevation of lo degrees, gene the calculated range. This increase of range by listing the ship has been practiced excountfully by allied ships in various congenumms of the war, and particularly in the long-range hombarderiment of the German fortifications at Ecobrugge and Ordon We understand that he our lates thereted designs the mounts are archanged by give a maximum elevation of 30 degrees, which of occesses, in any but vary acceptional elevanciances, wealth chybric when heart her acceptant for inting the ship is againful group to the secondary for the part of the procedure, such this gam, apposition to be an oriontification of the grant of this gam apposition to be an oriontellaria, such this gam, apposition to be an oriontellaria, such this gam, apposition to be an oriontellaria, such for these companions in the refuse against the special part of the such as the companion of the refuse against the special companion of the special compa

#### Electricity

Wireless Between Greek Britain and Australia —
The Dauly Mai reports that on September 22d last
direct wireless communication between Greek Britain
and Australia was established when two measures from
the Premuer and from first Joseph Cook were received by
the Amsignanted Wardees Company of Australausa
from the new station at Carnar It is stated that from
the message received at 8 Sydney were perfectly clear
and distinct, despite durect transmission over 12,000
mules is

Heating Rivers Electrically—With the employ must of women in many forms of work heretofore considered too heavy for them it has been necessary to modify the equipment and form of work in numerous instances. Such a case is the heating of rivers by electricity in charge of women instead of portable society forges operated by turning a heavy crank there society forges operated by turning a heavy crank there has been introduced an electrically-include florgy which is clean, simple to operate, and randily portable. It will heat a standard rivet in 30 sec ord s

A New Form of Variable blectric Resistance.—A recent German patent taken out 1 y 1 Straser relates to a modification of the type of resistance in which an iron enclosed in hydrogen is a strought by a heating cold As a well known, a small change in the current flowing through the basifing cold can be made to cause a very considerable change of resistance in the iron, and such resistances are claimed to have special applications for use with machines of very variable speed. The novelty embodised in the patent consists in making the heating cold of a material with a negative temperature conflicient. In this way, it is punted out the beating cold of a material with a regative temperature conflicient. In this way, it is punted out the beating on the rore wire resistance, and the anneativeness of the apparatus is accordingly increases.

Simple Resistance Units — To a British firm goes the credit for introducing a very sumple, type of resistance unit which possesses numerous and important advant ages. The virce of strip member is supported on a angle rod passing through the center section of each leg of the signaged wire or strip. Among the special advantages capacity, small weight for a given capacity absolute capacity, small weight for a given capacity absolutely markee the distribution of the signal ways of the signal surface and small bulk of metal they sool virt quirk) they are absolutely unaffected by vibrati n or jolts units can be run red but without danger of assigns repairs can be effected on separate units tapping can be taken off anywhere along the center cleamy the number of units being small compared with a grid resistance of equal appacity, there are not many joints to cause trouble

Electric Welding with Covered Electrodes -According to E G Rigby, speaking before the l'ngineers Club of Philadelphia, welds made by plain iron or carbon rods as electrodes are frequently deteriorated by pitting and oxidation, resulting in britleness and porosity and breaking up of the metallic structure Oxidation renders a joint peculiarly hable to corrosion, which in shipbuilding work is of the highest importance. In the covered electrode process the electrodes are surrounded by a covering of blue sabestos yarn which in fusing acts as a reducing agent, and by excluding the atmosphere from the fused metal effectually prevents oxidation of the deposited metal The yarn is coated with silicate of Na, Al, or the like to vary the fusing temperature of the asbestos yarn. The electrode further has combraed with it a small quantity of metal capable of emerting a strong reducing action, such as Al in the form of a fine wire incorporated in the covering. In operation the are is formed by touching the work with the end of the electrode held vertically, after which the electrode, still in contact with the work, is dropped to an angle, when the arc is immediately destroyed owing to the covering passing into the igneous state | I he action once started the electrode melts at a uniform rate so long as it remains in contact, and leaves a seam of metal perfectly diffused into the work, the sovering material forming a slag which floats and spreads over the surface of the weld as it is made. Steel plates or castings can be readily out by dipping the electrods in water and with a relatively high current applying the point of the electrode to the piace to he cut and marriag it quickly up and down through the thickness of the plate, allowing the molten metal to drop

#### Aeronautica)

The German Air Service —The Para newspaper Szeszer in an article on Criman station states that on July lat of the present year German station states that on July lat of the present sear Germany as after a cluded 1.50 shearer machines 300 protect map late 1.020 reconstituents as and 1.55 combers. In 1.020 reconstituents with the same state of the property of the state category included 1.2 mants. Germany loss 500 machines between July 1.61 and N. xemirr 1.14n and chieves 1.700 under the tree of the crimative leaving only 800 machines in with oil which are state and range finding arcraft. This state of affairs was the Parelson effectually prevents any thought of ugers on from the

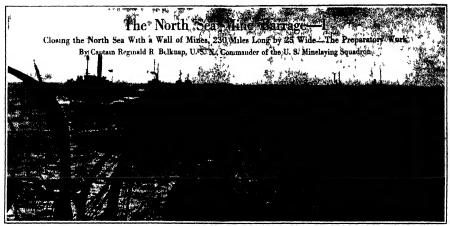
Bletot's Commercial Planes —I rom our Birtish contemporary Piety we learn that the Biront works are also interested in commercial avastion so much so in fact that two new four-sequence arrelates of large dimensions are now nearing completion. These machines it is reported will be especially studed to acreal transport in the French colonies where roads are none too good and rallways non-existent. In auth cases the arrelation will link up by postal air service one colony with another and with the capital while numerous other spheres will doubtless be found in which the large weight-carrying airplane will be of inestimable value.

Waterproofing Alrijane Propellers with Aluminum Leef — A waterproof coatum for surplane propellers, which incorporates thin aluminum leaf in the finish was developed by the Forest Products Laboratory at Madison Way, and placed in production by the Wat Department. The process is practically 100 per cent effective in preventing absorption of water particularly in the storage stage. A I rench authority states that 30 per cent of the French propellers produced are rejected by the pilots mannly because they are out of balance. That difficulty is due largely to unequal absorption or distribution of mosture and can be greatly reduced by an effective waterproofing coatine.

A Giant Farman Machine -The possibilities of post-war commercial aviation are being realized in all the leading countries It is reported that a new commercial airplane has just made its appearance at the Farman works at Boulogne-sur-Seine The new machine, which has been christened the Golisth, has made its official flights piloted by Bossitriau It is of the F 60 type and is capable of carrying 20 passengers. It is said to have a speed of 160 kilometers (about 100) miles) an hour, and is able to make a continuous journey of 3 000 kilometers (about 1 865 miles) littled with floats the Colleth is expected to be able to undertake the trans-Atlantic journey For a start the new mahane will probably be employed on a Paris-London passenger air route

The British Air Force —At the close of the war Great British led all nations in the air. The British air force lought on more fronts than any other nation and its successes were therefore proportionally greater. In Aquat, 1914 the British naval and military air service together mustered only 285 officers and 1853 men of other ranks. In November, 1918 there were 80,000 officers and 284 000 men. At the outbreak of the war forcest British and 166 airplanes, 45 seaplanes, and seven airplanes, while at the close of hostilities she had 21 000 sirplanes, and 163 airplane. Bendes, there were 25,000 airplanes and 163 airplane. Bendes, and 55,000 airplanes and saplanes being built and 55,000 airplanes engines under contract. The womens Royal Air Force which was not in existence in 1914, numbered at the close of hostilities 23,000

Testing Methods Which Preclude Accidents -On account of the difficulty in securing suitable pieces for the manufacture of larger airplant parts and the necessity of conserving material several series of tests were conducted at the Forest Products Laboratory at Madison Wis on built up beams and struts of various designs and also various types of splices. Results of se tests were used in preparing Army and Navy specifications for laminated and spliced beams and laminated struts Two simple non-injurious methods for determining the strength of struts have been developed and further tested for inspection work, which it is thought will considerably reduce the number of rejections under the standard method. The tests are made on full-sused specimens every strut used being subjected to the standard test which is more sovere than any working load could posmbly be



U S Minelaying Squadron at Sea, on route to the great minefield, North Sea, September, 1918

' SORRY not to be able to say good-bye personally to all your good fellows who have done such excellent work was the Christinas message from Rear Admiral Clinton Baker R N head of the British mining Admirat (1800) issaer it is need of the Britain mining service which only rated with our in Jaying the great mincheld barrier against submarines stretching from the Orkney Islands to Noway \ \text{chi in Admirat Sime address just be fore the American Minclaying Squadron left Portland I ingland for him, be said After we came into the was well signed a mine built it equipped the mine layers sent them over to this side and planted mure mines in less space of time than any nation in the world ever thought of doing before—one of the finest stunts the Navy has accomplished on this side

Reducing a new invention to practice in a few months is no small problem especially when it is a mine to be planted much depr and wer bottom 100-fathoms deeper than ever before yet this had to be done to meet the enemy s submarin campaign the most seri us menace to the cause of America and the Allies Along with hastoning our distriyers into the war zone our Navy Department advocated other active incasures essentially offensive to block up the Crman Lucia

Towards such an end British destroyers had been con stantly planting imms near the Cerman c set but they could not prevent the circum from sweeping clannels through Beades sance the Nekagerard could not be closed locally without violating the neutral waters of Deminark and Nouway the situation needed a barrier which wind melude the Nagerard and also be too far from the German bases for suppress in force. If only half successful such a barrier would still be more effective gainst submarines then merely buring them at large Yet it called for such numbers if min s to

provide and plant in a short time as to make the undertaking appear impossible

Among the countless war inventions pouring into the Naval Bureau of Ordnance upon our joining the war was one which unsuitable in its original form contained a device that was adaptable to the firing mechanism of a num with great possi-bilities if so applied especially against submarines. The peculiar virtues of the new mine were extreme sensitiveness and twice the rea h of any other name -both qualities invaluable. The result was briefly that the Bureau of Orda and could in July 1917 assure our niced authorities that in urging the closing of the North Sea they might at the same time offer the means for

its accomplishment

To convert the skeptical 1 to ardent advocates of the new mine to develop and test some of its features to outline plans and settle preliminarits all took time but on October 29th 1917 the order was given to proceed The terms impossible

and 'foolish were freely applied to the scheme. Co. tracts for 100,000 mines would have to be let, and ter of millions more spent outright both here and in Great Britain based on test of the mine only by parts since a complete new mine did not yet cast. But in spite of the several elements of uncertainty, the undertaking had unqualified approval of everyone in authority from the President down

Briefly the project was for the United States and British mining forces to cooperate in establishing a mine-field barrier across the North but I etween Scotland and Norway The minefield would measure 230 miles long Norway The minefield would measure 230 miles long by 25 miles average width, consist of 70,000 mines, in systems each comprising one or more lines of mines near the surface other mines deeper and yet more, deeper still so as to bar or imperit the passing of any vessel whether on the surface or submerged

Bases for assembling the American mines were to be prepared in Scotland, at Inverness and at Invergordon 20 miles distant, on Moray 1 brith above Aberdeen (onsiderations of navigation of shorter exposure to submarines and of saving the carriers time dictated the dicusion to unload all cargos of mine material from America a the western terminus of the Caledonian Canal and at kyle of Loch Alsh apposite the lale of Skye The cargose would be transported across Scotland by canal motor barges and the Highland Railway. Limited capacity of these transportation routes mecessitated having two assembling bases for our Mine Squadron instand of one These bases were constructed by the British Admiralty, Captain O & Murfin U S N, being the supervisor on our part and in charge of the bases when completed Most of their machine tools, diction to unload all cargos of mun material from

furnishings, and other equipment were sent from the

Secreey, as well as haste, necessitated dividing the Secreey, as well as name, necessitation dynamic are construction of the mine among 500 contractors and sub-contractors. Paris manufactured in different places were sent to a third place for joining, and all were finally were sent to a third place for jounng, and all were finally sent to Norfolk, Vs. whence they were shapped to Sociland where the mines would be assembled complete for the first time, ready for planting. The mine spheres were tharged with high explosive at a plant near Norfolk, containing large steam kettles, which poured 300 pounds of molten TNT into each sphere. In this quiet corner the sallow worked in constant danger from fire and the poissonous funces of the molten explosive. Several were senously overcome and not dead from the effects, but eriously overcome and one died from the effects, but the rest stuck to it through the long hot summer months

To carry the mine material over, small steamers were closery the mine material over, small steamers were rhosen to minimize the effoct on the operation is case of loss. One the Lake Moor 'was sunk by a submarine in April with 41 of her crive, making almost the only loss of life in the whoit operation. They had capacity of 2000 to 4000 tons and carried 1200 to 1800 mines, beedes stores of various kinds four minelaying squad-ron and bases were supplied almost entirely from America obtaining abroad little more than fuel fresh meat and vegetables. There were 24 of these carrier steamers constantly employed, from February on; two or three sail-ings every eight days, all under the management of the Naval Overseas Transport Service

Naval Overskas Transport Service
Towards making up a squadron large enough to
undertake the barner, we had the old crussers San
Francisco
Inyers in 1911 and 1915 In accellent condilayers in 1911 and 1915 In accellent condiprepared by the condition of the condit mentation The manufacturing output was soon to be 1,000 mines a day, and the was son to be 1,000 mines a day, and the round trp for one manishing operation could be estimated at not less than five days—coaling, senbarking mines, out and back, ready for the next operation. Hance, a squadron with a capacity of 5,000 mines would be needed to keep up with the supply and thus plant the barrier as soon as possible of the contract 
Eight merchant steamers were c Eight merchant steamors were converted to carry mines on me, two, or three decks, making, with the original two, 3,700 mines capacity, thus providing a good margin for contungencies. Mines are extract on tracts of steel channel bas, placed with the finances inward. The small wheels on the box-like mine ambier tread on the box-like mine ambier tread on the lower finance, while the upper fining serves as a chock against the manes 'upscribing in as a chock against the manes.'



Transferring mines from trucks to harges

heavy rolling at sea. The mine spheres are secured fast on the anchors, so that mine and anchor go overboard together, the release of the anchor taking place after they reach the water

our largest vessels, there were two long tracks on each aide of the launching k, which was the first covered dec tieck, which was the first covered deek, the same on the next dock lower, with shorter tracks in between at the ends, and similarly more below. On each dock there were several cross tracks, with a simple form of turntable at each intersection for convenience in leading the ship and to provide alternative routes for getting the mines out in case of a jamb.

Two launching ports bour 10 feet. Two launching ports on the step of the router, one on either side of the rudder head and about 20 feet of angle track led from each

about 20 feet of single track led from each

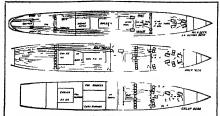
port, forward, to a switch connecting with either of the two long tracks. Steam winches were installed on all decks to haul the mines along in trains or feets of 30 to 40 Each nane with its anchor weighs 1,400 pounds and as its wheels are small it takes power to give the long trackful of mines the slow, steady movement towards the stern which is necessary to make the

planting interval between successive mines uniform
At the stern just miside the launching ports were
mine 'traps, which held one mine at a time on a slope Outboard, projecting about three feet beyond the ship s skin plating, the mine track curved downward, ending at sin pistung, the mine track curved downward, ending at de dageess Upon throwing lie trap lever the after jaws would open and the mine, of its own weight would frum down the elope over the curved quadrant and drue overboard. At the same time the trap a forward jaws would done preventing more than one min slipping through at one opening. The mine track near the trap was higher than the rest the up-prade serving to check the mine a surging sternwards while mining in a head set. Control throughout the mine decks was offered to

Control throughout the mine decks was effected by an electrical system of signal lights and gongs. At a contral point, near the launching ports the mining officer could communicate with the captain ou the bridge, by telegraph indicator and voice tube and could signal to telegraph indicator and voice tube and could signal to topo start, or reverse any min. Bitations were provided along the tracks, so that sentines, in case of a jam or anything wrong could signal to stop the winch con-cerned and also to "walk back, or 'all elear again. To enable the entir load of a ship to be planted in one continuous string elevators were installed in the forward part of the shape so that as the mines on the taumching

deck moved sternward those on the lower decks could be hauled forward to the elevators and sent up to be planted in their turn. The elevators were hydraulic or electric six in four ships four in two others. All were the Otis Company s standard platform type each lifting two mines Company a standard platform type on the transat a time in 20 seconds the round trip. The transact a time in 20 seconds was ample for the maximum rate of mine planting even if half the elevators should become disabled but during seven months in all kinds of weather, of 32 elevators only one failed—once
The experience of the British with elevators had not

been encouraging and their were other points where we took a new departure and succeeded. They had trouble from the tracks closing or opening with the working of the ship in a staway, thus binding the mines or allowing them to drop between tracks and jamb Our design of tases to drup netween traces and pann. Our design of a steel cross-tie mounted on a wooden bolster obvisted any such trouble, although our tracks were of much lighter section than theirs. Then there was the question of switches. Nome one suggested a parallel motion, privoting each switch rail at the single-track end,



Mineplanter "Roanoke," showing mine tracks elevators and turntables

which made our switches incr dilly simple and effective The aim throughout was to make the imming installa-tions substantial enough to cudare hard usage yet simple to provide power whire power was needed including ample reserve for temporary disablement Experience in our Mino 1 r living the preceding three years had taught that il riness intelligence and judgment of trained mine crews made the less depend ence and that, where kinky, sprii 5) wire rope and heavy lumbering mine weights were concerned automatic or complicated devices were dang rous

In brief the mining installati i mi i irganisation pro



The North Sea barrage containing 70,000 mines

vided for a well regulated m vn cnt of the whole mass of mines, in such a way that the ships trim was preserved as long as possible vial it in plut may sent on without interruption. The plus without interruption the flowstonic planted 675 n r s at 11½ seconds interval without a break, and on a litter oversoon the '4 anomeus planted a string I soft mines 43 miles long one every 15 seconds in thousand 10 miletter output long one every 15 seconds in thousand 10 minutes the minestysees other arrangem sits were very good though ventilation was sear if for lack of sufficient

blowers while fitting out. The batteries nowers while nitting out the batteries were small one five inch and two three inch anti-sucretif guns in each ship cept. San I rancisco and Battim rewhich had four senth guns. Guns were in great demand elsewhere while our ships were fitting out and for stru tural reasons also it was necessary to limit their arms ment to anti-submarin defense. It was contemplated that the squadron would always be escorted by distroyers and be

always be oscured 14 x d stroyers and be supported agounts art is error be. With names filling so much of the living dick space the cross were very crowded most of the time. Mines were constantly at one s (bow horis and slaip cerous over roady t) (ear me s clothes and every where were mine tracks half kine high or turntables () trip the aniwary. But no complaints good humer always. On

ship's joke demands a would chevron for every calloused shin. The efficers and men felt intense overy callound shin the enters and men net meets pride and interest in their ships and spared no effort to keep them in regular man-of war condition. The 10 American ships made a handsome squadron and the British officers as well as our own openly expressed their admiration

In capacity for carrying innes equipment for handling and planting them continuously and general arrangement and quality the America munclayers were admittedly (70 ) ntinued)

#### Fluorescent Fluids

PROI JEAN PIERIN Head of the Department of Chimstery in the University of Paris lias just published the prelumnary data and conclusions in coin action with investigations which is lias been making of the phenomenon of the finorscence of fluids the phenomenon of the finorscence of fluids these investigations were begun some time ago but interrupted by the war and it is not only now that Professor Perrin has felt his thosis to be in such shape as to render publication possible. The investigator has started with the idea that

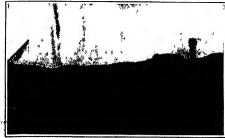
into investigator has started with the idea that fluorescence is in soin way a phenomenon of the molecule and with this idea is his prepared glass slides with the object of spreading out his fluorescent solutions to ultramicroscopic thickness. The immediate results of this procedure are to make it clear that fluor escence involves the destruction of the fluorescent hody—not a reversible reaction which would make it possible for the fluorescent substance to regain its luminous powers after a period of rest but something in the nature of polymerization to mention one possible vilanation advanced by Professor Perrin Indeed he feels impelled to suggest that parliags the molecule is fluorescent only at the very instant of its destruction so that in the most literal sense we have a phenom cnon of physical disruption

An interesting point brought out by Professor Perrin is that temperature and viscosity appear to ever in influence upon filtorescent powers. He even went so far as to compare results obtained at ordinary tem-perature and at that of liquid air with negative results far as appreciable difference was concerned

There is a good deal of analogy between the results Incre is a good oeal of analogy between the results obtained by the investigator and the known facts of fluorescence of solid bolies although Professor Perrin is carried to keep the two cases distinct. On the whole the discussion as translated in this work's SCLENTIFIC SUIPLEMENT, is a most interest ing one







Trainlead of mines on way to the quay

## The Service of the Chemist

A Department Devoted to Progress in the Field of Applied Chemistry Conducted by N. S. HOWE Chemical Engine

#### (olloids at Work

CRAHAM discovery that if par hinear or parch among party is stretched over a frame to make a hypthage that such a lapsthage that such a lapsthage or membrane will exparate substances into two general closes. Those which can pass through a self-time and the se which can not or only do so with gen third out. It is satisfances which can pass are only capable of longer yestellanded while can pass are only capable of longer yestellanded while can pass are us tally capable of being systalized while the thers are 1 lly like and their solutions have proper to a which differ markedly from solutions of well known erestals. A favorite experiment is to place a solution of salt and of gluen a nembrane on the other side of which wat r flows slowly like salt passes through into the wat r and son the glue only is to be found in the membrane covered cell

This principle has been applied commercially in several industries and is variously styled dialysis diffusion, semesis et. Some exvisaline substances diffuse more rapidly than others so that certain separations can be made between crystalizeds as they were originally called 5 metures the vegetable cell itself becomes the membrane through which sugar for example is extracted by treating the sheed beet in this instance with successive changes of water. The temperature is made such that the abinimus are first congulated in the cell walls thus facilitating the passage of the sugar solution and then cight or more changes of water are brought into contact with the pencil size V-shaped slices upon the counter current principle. This allows frish water to take the last of the sugar (all but about 0.5 per cent for it is not economical to carry the extraction below that figure) from the nearly exhausted pulp and the juice of highest sugar content to be drawn from the first cell for purifica-

In the beet sugar industry we also find an example of osmosis using a membrane. A point is reached in crystallising out the sugar when even impure crystals cannot be wen from the residual molasses. This molasses contains above 50 pr cent of sucrose and is unlike molasses from cane in bring unsuit d for human use The sugar is recovered by precipitation with strontium or lime or by issues. In the latter method the diluted molasses passes slowly along one side of a series of membranes and water flows in the opposite direction on the inther side. A large percentage of the sugar passes through

sugar passes through Within comparatively risent years colloids have been studied more intently and minh work has been done in a effort to learn more of what socially takes place in reactions involving them. Their aqueous solutions when pure have the same bouling and freezing points as the solvents the maclives so the conclusion is that they are not true solutions but its search of the particle in suspension. These particles passe through the finest hilter paper sand evint are most maintained to the condent has particles passed in the particle passed in a small to be seen under the microscope The ultra microscope enables some studies to be carried on through the observation of the shadows cast by the particles and light reflected by them. Col-loidal gold is responsible for the beautiful ruby glass and colonial copper was used for red signal glass until chemistry pointed the way for the employment of selenum to produce that color

There are many who grow important awarting some practical results from a addenic toward which seems at times to move with the speed of a gleener and yet progress is not made without such research. How often progress is not made without and restaired. In we offer our ative medicine has been compiled to wait intil a way of communicating the discussed inder investigation to lower animals for study could be devised. We know now how to propair colloidal suspensions and that will head to many commercial applications. At least two
may be mentioned as accomplished and one of these has been developed as a result of the war

The importance of a concentrated easily handled efficient fuel for war and merchant vessels is obvious and in times of emergency when speed and space count for most this importance is greater than over A colloidal chemist conceived the idea of fortifying fuel oil with colloidal coal so fine and in such a physical condition that it would be permanently in suspension go where the oil would and pass through the small orifices of valves and burners without clogging them Experiments showed the idea to be sound and its further development will be an efficiency and conservation measure

The extensive use of metal automobile bodies in troduced a problem in lacquering and enameling for, in order to get the required hardness and durability in the finish, it must be baked Eventually electric ovens of

great size were installed and all went well until, in an effort to economies in the use of currant the ventilators would be closed or partly closed with the result that highly inflammable vapors from the leaquer and cannot evolutile solvantic solvantic solvantic solvanties of the covers. There were fires and wild explosions, loss of work and disturbed ackelulus.

has condition affected the oven manufacturers more than the cannel makers and one of those making electric heating and controlling devices for ovens in-stituted research not on the apparatus but upon an and the control of the apparatus but upon an account must be expensive and troublesome volatile solvents. The problem has been solved and the anne covering materials—gums, pign not set may now be had in colloidad forts in water. They cover well, bake without any material variation from the usual bake without any material variation from the usual mit thods of treatment and whin mit on the metal the result is the same. The event into be operated to suit for there is no danger. The element of safety and freedom from property loss have been secured without increased cost, if indeed not without an actual saving in

creased test, if indeed not without an actual saving in the expense of enamals. And then because the gume art in suspension and not in solution there is nothing to it is clearly interest stick together. They may be put into a wire basket, dipped into the collocal lasquer and haird without being removed and given the individual attention necessary with other leaguers. If the mid can be backed sightly before dipping a still better job to he obtained. There we not fits decrease and no works of without careful and the second of the contraction are no fat edges and no marks of adhering to other pieces. Such lacquers or enamels may also be brushed on or sprayed as desired.

These developments are real steps forward and further achievements along these lines may it expected. Col-loidal chemistry and physical chemistry theoretical index (nemistry and paysical definistry theoretical though they may seem, are accord, lishing great things for industry and when we begin it graduate chemical enginers well grounded in these new divisions of chemis-try, still greater things may be expected.

#### The Reporters' Chemistry

The Reparters' Chemistry

A GROUP of schusters who are discussing the
A courses which a obsenced inputer about take in
order to be all that the tith might be said to imply
finally included nearly all the inputering and applied
science available in addition to a few years spent in
obtaining a broad foundation in guaral subjects. They
left but a few years for practice after greduction in the
span of a normal life whan all the suggestions had been
combined! And so also a report in must repeature or
spend most of his years in proparation. The articles
one sees occasionally, surely covince us that too often
science is omitted from the reporter accurrentum.
The recently reported "explosions in a molasses tank
is an oxample of what besidines can do and how often
the story is more dear to the reporter that the more

the story is more dear to the reporter than the more exact but somewhat less spectacular facts. Things lose their news value if investigations are awaited or time

their news valued investigations are awaited of time taken to get an authoritative opinion. In one of our largest cities a steel tank had been oracted in which to store inclusives used in producing industrial alcohol. The sank was of great espacity and succeed in which to store inviseous used in producing industrial alcohol. The tank was of great oppacity and was near the water front so that vecceis could pump than recys unto storage and hurry away for another lood while the tank a contents fed the destility with raw material. One day things suddenly gave way not there was a loss of a number of lives basiles some property demands appropriate word to describe what had happened and ditailed the gayawar of molesses thrown high in air to inconced with rast destruction on the ventility. All this was supposed to be the result of fermentation and when it was found that 500,000 gallons of fresh molesses had just been pumped in those adhering to the theory explained that that formed a seal over the older stock and helped to confine the gas. With the molesses unterrage through a pipe in the belief of the tank it is difficult to the store of the st

Fermentation is a very powerful agency but szarie this power just as powder does, only take confined. This is "springer in the canning industry are cauged by the pressure of gas within the can resulting from formentation. The in an insulily withstands this pressure but glass once have "Blown up." But even a small level will carry away the gas as formed and this tank had a gooseneck vent-pipe about five inchair in diameter. Then there were manholes, the doors of which remained doesd only by their own weight and one was open ready for stating.

only by their two ways.

Benefit, the task roof was intended marely to beep out.
Benefit and task injust roof would have been destroyed to weather and task light roof would have been destroyed to when existent tests were made the roof was found intent on the ground where made the roof was found intent on the ground where the makeding food had left it. It seems reasonable to have expected such a roof to function in the same manner.

As have seath roofs in provider mills where they perve as de light weight roof in powder mills where they serve to vent any explosion upward. No one seems to have heard an explosion

heard an explosion

There have been a number of experts to examine the wreak and the only published riport, that of the grand jury, duclaims the explosion theory. Them bow explain the catastrophe? Mechanical failure at some local point following the cumulative effect of repeated stresses and there is remote possibility that a few rivets may have been weakned through the gradual and weak attack of acids occasionally present. Molasses, being of high apprint gravity, would soom votes a small breask asspecially confine gravity, would soom votes a small breask separably the configuration of the strength There have been a number of experts to examine the

#### Made-to-order Gravel

THE majority of contractors have to take gravel as they find it and geologists tell us it was a long time in the making. It seems that it may no longer be seen-sary to wait for nature to form gravel from clay but that it may be made when and where wanted and the method is described in a recent number of the "Little Journal"

It seems that there was no gravel suitable for an ag-It seems that there was no gravel suitable for an aggregate in concrete to be found near the location of a southern shipyard where concrete ships were to be built for question was newerable in these way. More the yard to gravel, had in the gravil over congested railways or make the gravel from local clays. Fortunately the clays were found to possess the necessary characteristics to snable them to be burned to hard, though porous, lumps and a second series of experiments showed that when the rate mad temperature of burning were controlled it was possible to produce lumps of the desired size.

were controlled it was possible to produce immps or use desired size. This firm, we see a rotary consent thin and when the concrete was finished it was found to pass the strength tests and to be nearly as strong as any other concrete. Then it was demonstrated to have tingstand becomes and that meant that a given number of tests to be a superior of the strong of the strong of the strong to the strong of the strong of the strong of the strong concrete that the ordinary concrete and almost as spring as

more than the ornamy concerns not account as spany as the steel vessel a strikingly Richtentier of the old agging that a cossisty is the mother of levention and spows how accessed in finding a substitute for a specific purpose sometimes improve on old materials.

#### Rebuttules for Hickory Maniles

CTRCIPICATIONS for handles for intersuching to use prepared during the west by the Forest Ryle Education, at Madigan, Was, alliveing some strices speaked in place of history and shee general pattern speaked in place of history and shee general pattern denotes which have been been as the place of the pla

# industrial Democracy and Engineering

Some Lessons That Have Come Out of the War

By Irving A. Berndt, Secretary of the Society of Industrial Engineers

CIVILIZATION, ever progressive, is completing its latest great step forward and after monumental effort, almost inhuman sacribos and a stupendous massing of resources, we are promised a great world

democray

Even before the culmination of this advance, and
seemingly as an outgrowth of the very program and conditions which have made this step possible, this same
insatiable eviliation is making a new demand for advancement. It is from all indications now insisting that

wanesent it is from all indications now measuring that we must have not only a great political world democracy but a great industrial democracy as well. The great war was proven that not only must the old political regime be changed and readjusted but a re-consideration of the industrial and economic plan must consideration of the industrial and economic plan must follow and if possible go hand in hand. The great world leaders and the best minds are coming to a thorough appreciation of the fact that workers and producers of the divilized population of the globe besides being goverand politically along the broadest kind of demo-cratic lines, must also be allowed to produce under a smilar plan and set of principles. Does this not spell an industrial democracy in every sense of the word?

Here it might be interesting to consider for a minute what steps have led up to this new development. It what steps have led up to this new development. It has been especially interesting to study it in America and to see, sometimes gradually sometimes slowly and some-times over night, the marked changes which have come over our industrial verspoints and attitudes Ex-periences has been doing it bit for us in this country during the war. Many things has it laught and espe-cially as regarded the industrial activity necessary for the votory we won, has it given us lesson after lesson Then, too, these lessons have been generously appor-tenced, not only to the government administration and management but to each individual worker as well

us consider some of the very well known features which, coming out of our war production requirements are here to stay Broadly these can be classified under

two headings. First, those dealing with the principles and plan of organisation and management control and second those which have to do with the personnel and individual worker under the firm. In the first classification these propularly accepted are probably as follows:

(a) A plan for proper fun tromainstation of response

- (b) A plan for centralizati n of control and manage-
- ent of each function
- ment of each tunction

  (c) The application of expert knowledge to each of the arious problem
- (d) The use of the trained a and the development of a plan of more intensive training for this pur
- (e) A plan under which lefinite programs of all
- activities are preplanned

  (f) A most intensive plan if specialization

  (g) A plan for producing absolutely on a basis of

quantity production

Under the second class the laving to do with the reconnel or individual, we find a new acceptance of the

(a) The proper solection of men for each job

(b) A carefully worked out than of proper distribution

and assignment
(c) A well defined and star tirtized incthed of in

tensive training

(d) An adopted provision fractificatory conditions of work and activity work and activity it seems hardly necessary (1) is lin k and justify the acceptance of each one of the first rice. Suffice it to acy that they have all been used as of found not only valuable but really essential and for each there are specific applications available in further analysis and specific applications available in further analysis and provided the second of the specific applications of the Sheet vs. Service Dead without the proven access of the Sheet vs. Service Dead without which our armies would privable still be in bloody

combat is an example of not only all the features stem

And from all this has come two big realisations so big in fact and so fundamental is to make them we believe a possible keystane for the Industrial Denoise believe a possible keystane for the Industrial Denoise racy for which there seems to be such persistent and continuous demand. Both are so equally important that it is extremely difficult to know which to set forth first. They should not be considered a sparsately or in any order but rather in conjunction.

The one is the realisation by the mass including all of us as workers producers or traders of the need for proper leadership and control and a leadership based not on wealth social distinction or political power but one coming from proven ability and experience as well set the necessary training and education. The other is the realisation by these accepted leaders and directors that at the very base of every problem of management and control is the human factor and hence there must be as a part of this leadership a since re appreciation on their part of the problems and viewpoints of our workers and a real desire not only to study their requirements but in complete cooperation to fulfill them

The writer ameerely believes these two visions have come and despite the scattered outbreaks of strikes and industrial unrest is entirely optimistic of the outcome because of a complete confidence in the higher intelligence because of a complete confidence in the influence account of average American people who with such visions will live up to them. Nor have those now convictions come alone to those in this country. On the battlefields of trance we believe all of our soldiers have had a similar experience and when they all return we shall find that the men in the ranks have learned to respect able leader-ship and that our American Army officers will have learned to respect and appreciate human relationships.

These men will be a big factor in our industrial readjustments

Returning to the question of definite industrial (Continued on page 254) A Phonetic Alphabet

A recent correspondent of your journal desires a conetic alphabet. Hundreds of thousands of dollars

Oxford Dictionary employs about a hundred

EWING STRANGERS

phonetic alphabet Hundreds of thousands of dollars have been spent in this country to bring this about but

all without result I think the public will never adopt one

symbols as a phonetic key to its preninciation of Figlish words and some phoneticians say that it would require a thousand or more to represent all the sounds of human

There are really but 33 elementary sounds in our language but our text-book makers will have thirty-

To the Editor of the SCIENTIFIC AMBRICAN

### Correspondence

The editors are not responsible for statements made is the correspondence column Asonymous commu alcations cannot be considered but the names of cor respondents will be withheld when so desired

#### "Delenda est Carthago!"

To the Editor of the Scientific American
"Defende set Carthage was the demand which Cato
the old Roman senator appended to his every speech
in the senate of Rome, year after year until finally dedemand was satisfied Oh for a greater Lodge who
should have arisen years ago in our senate to exdaim as a part of his every speech Defende set

Germany must be destroyed It has forfested its right to existence as a political entity During the 80 years of that existence its sole reason of arc has been conjust and domination, political and commorreal it has been a constant center of plotting scheming and threaten hig, sterrotians the rest of the world from England to China and compelling a worldwide bursten of armament when, without it, would not have exasted Prussia is both by also and aggressiveness the boss of the conjustic of the conjustic configuration of the conjustic conjustic configuration of the transpired first compelling by threats the North German state form the conjustic configuration, the bringing in by the same force and terror Bavaras and the south But even without Prussia the inherent German beat Germany must be destroyed. It has forfested its in by the same torse and terror mayari and the source But even without Prusan the inherent German bent toward "conquering the world "--shown long ance in the Bansa league---is too serious a matter to be allowed to pursue its further way unmoisted out of mers senti-

mantalism
Germany will probably, after this war, definitegrate of
its own accord. But it is done not, that should be one of
its own accord. But it is done not, that should be one of
the terms of peace. The peace of the rest of the world
demanded the dissolution of the German trust into its
ecomponents states, even as that of our country demanded
the dispolution of our trusts
it wends be true calcanity if, after all the world has
suffered. Princip about of the allowed to concline to
distinguish size other ricks. Pransia must be included,
and hope probabled hereoforwest. And lets us remember

that Prussia has entirely cast of Bothn Rhenisi tone rrusses one entirety cast it is the in Interests from a part of Prusses is no part of Prusses priper being detailed from it and constituting men's that territory which the Prusses kings, by hook or is conquest their very like the result of the resul away the rich numeral, agri ultural and manufacturing dattret sending the Prussians 1 & to their fore and figure on the shores of the Baltic at 1 & 1 will have direct the teeth and claws of the tigs 1 b vind possibility of regimeration. Then and unit the shall we have a poace that resease to demand air circular vigilance and preparation for war. Let thin be fluxled as at the beginning, on one sude by the 1 clts and on the other two by the Poles and it is a safe gues that they will not have much chance in future of you hing at the expense of their neighbors, threatening the ristate and countries accounting solones in the Powle on training the Baltic asquiring colonies in the Pacific or turning the Baltie into a "German lake

Rosharon, Texas

#### The Ideal Shoe

To the Editor of the SCIENTIFIC ANERICAN To the Editor of the Sorgeriri University Prom. the Deginning of the world show have been from the Deginning of the world show have been at claborated process of construction. Think that the casentifically designed show does in tend yet. I mera one with a rigid frame only capable of those move ments needed by feet. It should be covered by any y quired material. If any part of the frame or material should be worn out, it could be casely refereed.

#### The Wireless Amateur

To the Editor of the SCIENTIFIC AMERICAN
I wish to thank you for the publicity you are giving I wan to trank you tor the puniorly you are giving the caims of the anisatior wireless operators, as shown in your solution of December 28th 1918. It would be a great loss to the scentific world and to the nation, if the activities of the anisateurs are in any way discouraged or limited. Their work should be encouraged and favored by the Covernment. H A J UPHAM

Milwaukee, Wis.

When will our politicians legin to understand it?

Delonda est Germania!

#### Washington D ( That Molasses Explosion

ven to forty-five

To the Editor of the SCIENTIFIC AMERICAN
I have just been reading in your issue of February 1st, I have just oven reading in Your saute of rebruary lat, some comments of yours on the recent explosion of a tank of molesses in Boston. That the explosive potentialities of molesses were reorganized a long long time ago is quite evident from the language of an old song of which I send you one viree and the chorus.

Old Dan Tucker come to town He swallered a hogshead o lasses down The lasses worked and the hogshead bust And off went Tucker in a thunder gust Свович

Out o the way old Dan Lucker Out o the way old Dan Tucker Out o the way old Dan Lucker You re too late to come to supper

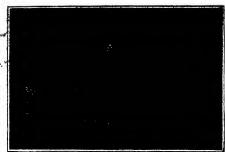
As a poem no doubt the foregoing leaves much to be The language is inclegant and the last line of the chorus is certainly a lame and impotent climax following the tragedy of the previous stansa. Nevertheless compared with rea libre it is a literary masterpiece I have known this song since about 1855 and quite possibly it dates from 1775—I do not know The verb to work used to be commonly employed by country people to describe fermentation Cider, preserves and molasses with some other substances "worked under rtain conditions

Hartford, Conn.

F S LUTHER



Duating a big bos constrictor with arsenic powder to kill the piraplasmosis



The blotched chicken-snake, which was infected from the feathers of its once-in-forty-days meal

# Ticks as Carriers of Animal Disease

Inferences Drawn from the Destruction of 500 Reptiles at the New York Zoological Garden During Several Years By W. H. Ballou, Sc.D.

DAH's newspapers recently reported that some kind of an epidemic existed among the reptiles at New York Zoological Park Losses of over fifty anakes daily were ascribed to cootics a name given by the British Tommics to the french louse

Dr Raymond I Difmars Curstor there of reptiles and author of Reptiles of the World admitting to the and additior of reptities of the world amulting to de-writer that an epidome, had been raging defined that it had been caused by cootes. Incidentally he stated that the carrier of the disease was a tick and that a check on its ravages had been secured by use of a libral coating of arsenical insect powder on the scales of the snakes, lisards, etc. Over 500 snakes succumbed during the past several years before the check was dis-

By this it should be understood that Dr. Ditmars has

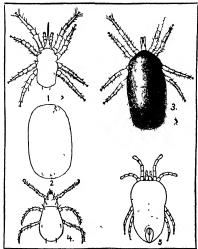
only succeeded in getting rid of the ticks in the Reptile House, thereby preserving the remaining reptiles A new consignment of reptiles inay at any time reintroduce the epidemic The droad disease of Piroplasinosis which annually wipes out inilions of deliars worth of cattle, fowls and domestic animals generally in different parts of this country and the world is according parts of this country and the world is according to bacteriologists the disease which is destroying the snakes. The value of a serum is indicated by Muir and Ritchic in the new revised edition of their Manual of Bacteri

clogy when they say disease) of infection by Piroplasmata, we know nothing The diseases are often extremely fatal carrying off meanly every individual attacked but we do not know the nature of the changes originate i

Suppose a half dozen Zulus from South down in a crox led New York theatre. Close contact would sur by result in these Zulus giving off the diseases to which they are in mune at home and infecting some or all of the crowd of strangers to which they were intro-duced. The Zulus in turn night be infected by the germs carried by New Yorkers to which the New Yorkers were minure. Neither of the parties to this meeting would have natural decresses against the diseases of the other Presselv that is what happened at the Brons Garden Some Iguanas (lizards) were re-ceived from South America. They bose upon ceived from South America. Buy hou inpon that bodies titles from it is parisated ideas et on which they were timining. The prizated carried by those titles laid never be in able to break down the defenses of the iguanas although constantly irritating them. On arrival at the Bronx Garden, filled with keel scaled vankee the takes acampered off the backs of the iguanas and stracked the defenseless snakes Im-mediately there when a preferent first among a large group of Australian anakes Having killed off the entire collection from Australia.

the ticks attacked all other anakis finding easy victims among those with keel, rather than smooth scaled snakes. The snakes which alone escaped attack were those from South America where the iguanus came from showing that they too, in their own environment, had acquired immunity

The keel scale may be described as rough with a ridge across it, as against a large scale which is smooth. The leel scale affords an opening into which the female tick can thrust down its head and lay its eggs in the blood can thrust down us ness and lay its eggs in am one-liere the young ticks hatch and live a subcutaneous life A parasite is released from the blood in the tick egg into the blood of the snake, where it breeds with continuous rapidity I he parasites accumulate in the lessons of the snake, a septic condition follows and death is esuised by intoxication (blood poisoning) Cobras from India are not affected The American gopher snakes are affected only



The ticks that carry pirapianmosis. (1) The female, (2) the egg; (3) the tick after feeding on animal blood; (4), (5) the chigger or tick that attacks humans

around the eyes, which swelled up in some, caising total bludness. The Australian keel-scaled anakes were rapidly swept out of existence—a clean sweep-from blood poisoning. Many other keel-scaled anakes succumbed. Dr. Ditmars observed that anakes in damp cages succumbed most readily. He put them in dust cases with feet ratification and the misses according to camp cages succumbed most readily He put them in dust cages with fair results and thereupon evolved the eure. By dusting the anakes with an insect powder, containing a small percentage of arsente, the openings of the scales were closed and the ticks killed. Ticks also the soles were closed and the ticks killed. Ticks also caused skin theses, that is, cruptions, or tileers of the skin which the use of the powder ended. The powder, penetrating the pores in the skin, naturally risched down, in some cases to the oggs of the ticks, killing them A sick snake, reached in time, thus had his enemies killed, his ulters and infection of blood given a chance to be met by the reptile's natural defenses. A cure followed,

if the snake was not too far gone before applica-

if the snake was not too far gone before applien-tion of the powder.

A snake, of course, is an extremely nervous animal and griting him thoroughly powdered is some job. Handlers of snakes have to be careful with affected snakes, as he toke readily and willingly transfer their operations to humans whose blood they somehow know is far cases to reach. Many types of snakes carry mai-arral germs but are immune from malaria. When, however, they come in contact with snakes without such immunity, the disease takes snakes without such immunity, the disease takes hold of the non-immunes. The igunas and the snakes from the same region of South America are immune from the blood contamination and ulcers caused by parasites born by ticks. These same iguanas and snakes, however, when introduced to reptiles having malaria or other diseases, get those diseases, having no immunity discass, get those diseases, having no immunity thereform. Thus is shown plainly how disease may apread among humans and lower animals It also indicates that we get diseases from which we are not immune by contact with persons or lower animals which have the germs persons or lower summans watern involving grains but are immune from them. We leave New York and travel. We get disease in a new locality from persons who are immune. The strangers we meet get disease by contact with avangues we meet get usease by contact with us by acquiring our germs from which we, sur-selves, are immune. These matters which have been proved by the universal war on disease ought to impress our health authorities with the fact that mere quarantines are not enough to wholly stop the introduction of disease as has been shown by the world-wide spread of influensa. Let the people or animals out of quarantine and they immediately give off the garms from which they are immune to people who are not immune, and vice versa. Our previous knowledge of tests as carriers of

blood poisening parasites has been summed to date in their new edition of the Manual Bacteriology, by the distinguished scientis

Decime Robert Muir, Pathologist of the University of Glasgow, and James Ritchie of the Royal College of Physicians' Laboratory, Edinburgh Of Piroplasmous they say.
"Up to the present, no human disease

"Up to the present, no numan diseases has been proved to be associated with the presence of piroplasmata, but several important diseases causing world-wide devastation of domestic animals are almost

Impuriant disease causing world-wide devastation of domestic animals are almost certainly caused by protonous parasites of the group Timman, however, bring of the group Timman, however, bring the protonous parasites of the group Timman, however, bring the protonous designations are set of the protonous pr

different appearances or shapes in the cells current appearances or snapes in the centre.

The forms free in the blood may obtain entrance into the red cells by means of pseudopodia, or prolonging their pointed ends of protoplasm Infection is usually carried from infected animals by ticks In one case Koch has described the development of the organism in the stomach of the tick, of spiked protoplasmic processes sprouting out from the broad end of the aprouting our from the broad end of the protoplasm, and the joining of two such individuals to form a sygote, or firtilized egg Observations by Christophers in-dicate that a new globe-shaped body now dicate that a new globo-shaped body now appears, called the oboyet stage and further development consuts in a division into sporoblasts or minute bodies which may affect the whole tusue of the tick, espe-cially the salivary appratus. The eggs also are affected, and the young ticks devel-oped from these are capable of carrying the disease to other animals. Frequently when an animal has passed through an attack of piroplasmosis it is thereafter immune to the disease if the parasites have not disappeared from its blood ticks feeding thereon may give the disease to other animals not immune

'The parasite Piroplasma bigeminum coording to Theobald Smith is the cause

of Texas, or red water fever, a febrile condition which occurs in the Southern States of America Argentine South and Central Africa, Algeria, various parts of northern 1 u rope and in Australia The organism gets its name bigeminum from the fact that it is often present in the red blood cells in pairs, which may be attached to one another by a fine thread of protoplasm the re-sult of delayed division of the cells. The infer tion is spread by the tick, Buophilus hovis and some of the charac terratics of the disease teristics of the disease are explained by the fact that this insect goes through all of its moultings on the animal on which it slights

'The parasite Piro-plasma parvum was discovered by Theiler in the blood of eattle in the blood or enture suffering from the African East Coast fever, a disease closely resembling the Terms ding the



Examining a newly arrived anaconda from Central America for ticks

and periodically extends inla 1. The organism is small and attenuated. It is the 1 roots of the tack Rhyi cophalius appendiculatus, and it drops off from earlie to do its moulting. It can carry an infection much more quickly and widely through a herd of cattle than the carrier of the Texas fews.

"The parasite Piroplasma c jui gives rise to binary fever of horses It also is a South African disease.

which had survived the discase was injected in a horse the borse suffered but shightly thus suggesting a possible line of imminity The parasite Liroplasma canis infects dogs through infection by ticks Man is affect d by both ticks and thig

Man is affect d by both ticks and chig gers of the Order Assiria. The chigger is a strange may there is lie or rather she is so parts tillar II female dro-off i tree out. In use neck in I goes under the 1 light way of it space between the 1 light way of it, the upper part of the near however deem it contain her justicular d liency. She descends to a point below the kness stocks had full down underskin and lays eggs in the humin 11 od - Dr. H. I. Chittendon of the Det artment of Agreulium Washing tor says of them. Thes posts are the larval or six legged form of harvest units the adults of which have eight

carried by the tick, R everten. Theiler noted that when the blood of a donkey

Soon after Leptus irrit ins burrows under the skin, legs 'Soon after Leptus irrit ints burrows under the same, through the larger award price a small ref as t ap pars after which the surrounding surface be ones compared the afferted are a preading if he mfamed spot later fasters with a wit r blister. If the victim gate framit learns of the resulting irritation and scritches the same crystales or blood screening namely, fellows.

personing usually fellows In Central America a chigger burrows under the te mails of humans usually causing the loss of the nails after the exist lat h and the larvae cause ulcers I ffi tive treatm at has been had by use of parmangainst of potash used in the same

munct as in case of sunke bites At the Bronx Zoological Carden is the

This young lady has discovered the possibilities of dried-apple sculpture and has made it a novel art

of what can be done in the way of dried-apple conjuture each doll simulating a living Tennessee mountaineer

#### (Continu d n pag 260 Dried-Apple Sculpture

DOWN in Knexvill I can lives Miss and distinct art to be brief she has diveliped stried apple sculpture with re-inarlable results as is evident from some of her work depicted in the accompanying illustrations

illustrations. For years Miss Million has been in-ter-sted in the various types of moun-ratiners who came down to her father a store for trade. Having artistic ability, she tried a good miny times to model thing quanti and weether beater faces by the conventional methods of sculpture. but the results did not satisfy her One v ning while cutting apples to dry them for the future she picked up a piece of partially dried up a and noted its striking

r semilance to the wrinkled face of the usual elderly moun en kavored to portray laking up a sharp kille she did a little cutting so as to feebour tle wrinkled apple int a human face. The out COMO MAR IN 181 BUCCERS fil she saw possibili ties in this newly dis covered art and she set t work experi m uting in dried-apple ur dipture Inthe by expert in making dolls hese heads are simply hied apples cleverly ut before they are des 1

Miss Million has found a satisfactory preservative with which she varmshes the dried apric heads when they re ched the de The costumes and as considered are carefully contidered Miss Million always has some particular person in mind when she a dried-apple face



The proposed North River Bridge at 59th St , New York Length of main span 3,800 ft , height of towers 600 ft., capacity: 8 steam rathroad tracks, 6 trolley tracks, 2 automobile roadways and 2 passenger promonades

# Railway Terminal Problem at the Port of New York

Plan for Bringing Manhattan Island Into Close Connection with the Railroad System of the United States

THI New York and New Jersey Port and Harbor Development Commission recently invited Gustav Lindenthal who designed the Hell Cate arch bridge Indentinal who designed the 11cm case aren brings to give his views as to the bost method if solving the transportiti ii problem at New York particularly with regard to the Hudson River and the transfer of freight and passe ingers between N w Jersy and Manhattan

#### Earlier Attempt to Solve Problem

We recently drew attention to the fa t that over a quarter of a (cutury ago the urgent need for lietter communi at m between Manhattan Island an I the main land was fully recognized. The great railway systems that terminate on the Jersey water front were particularly concerned with this pr 11 m and an attempt was made under the initiative of the Lemsylvania Railroad to get combined action of all of the initroids for the creation of a great bridge across the Hudson River for the accumumodation mainly of the steam railroads but also of trelley tracks and vehicular traffi Partly because of he inclination of the rule pads of that day to throw the greater part of the hurden of construction upon the Lennsylvania Railroad and partly because the development of the electric locoin tive removed the principal objection against tunnel triffic the bridge project was abandoned and the Pennsylvania Railroad built its own tunnels at 33d Street

#### The Present Enlarged Sch

The plan which Mr Indenthal presented to the Commission is shown in the birds-tye view of Manhattan and Jersey ( ity which will be found on the front page of this ossue

So far as the railroads are concerned it will be a that every one of the systems which now terminate in Jersey (ity will have direct entrance into Manahattan for freight and pass ngers and also unbroken communication with the railroad systems on Staten Island, on system is so arranged moreover that all railroads which enter what it is hoped will be the free port of New York will have direct access to tidewater throughout all

Nork will have direct access to indewater throughout all the stretch of shere from tage, both on the Hudson and base flivers and on the Upper and Lower Bays. The total estimate i cost of the project is \$211,000,000—a large sum considered by itself it is true but not so large in comparison with the total cost of approximately \$500 000 000 of the subways used merely for local passenger transportation in Manhattan and Brooklyn

#### What It is Proposed To Do

The main elements of this comprehensive scheme are

1 A belt line situated about two miles from the Jersey water front and intersecting all the railroads that run to tidewater

- 2 A large freight classification yard for breaking up and reassembling freight trains for dispatch to the several destinations of the freight
- 3 A railroad and vehicular bridge across the Hudson River opposite 59th Street Manhattan by which freight and passengers from the West could be carried directly into Manhattan
- 4 A large central passenger station 800 feet long by 480 feet wide to be built in Manhattan
- 5 A two deck elevated railroad with four tracks on each deck kading from the bridge and extending along the Hudson River water front of Manhattan Island from the bridge to the Battery, and a tunnel at the Battery

connecting the southern end of this elevated railway with the railway system in Je

6 In later years, when the system outlined above is on it is not years, wear too system outsine above a completed it may be strended by carrying the marginal elevated railroad around the Battery and up the casterly short line of Manhattan on the hast liver, and also by building a tunnel from Greenville N J across to Brooklyn to connect with the existing railroad system on Long Island

#### Hudson River Bridge, the Key to the Situa

It will be realised at once that the most important link in this whole project will be the huge bridge across
the Hudson River at 54th Strict Because foundations
in the middle of the river would have to go down from in the middle of the river would have to go down from 250 to 30 feet to find rook bottom for a pior in midriver it is absolutely necessary to span the entire width of the Hudone without any intervening pier. This means that between towarts the bridge must measure 3000 feet which is about doubt the span of the cutting Brooklyn suspension bridges. Good rook foundation can be found on each shore of the rive upon which the mann be found on each shore of the rive upon a which the mann of the state of the finings tower in New York, which is served. The bridge waited he earned on four calls in each of which, if bridge would be carried on four cai les each of which, if bridge would be carried on lour call see can on write, it built of wire would be five feet in di meter, as compared with the 15-inch diameter of the cables of the old Brooklyn Bridge. To get the necessary gurder width to result the enormous wind streams, the bridge would have to be about 175 feet in total width and thus on a two-deak structure would provide on the lower deck room for four reaght and four passenger-train tracks and on the upper deek for six rapid-trainit tracks two wide drivoways, and a passenger promenade By far the greatest load that the bridge would carry would be the deadload of its own weight. All the heaviest trains says Mr Lindenthal, and all the vehicular loads that could be put on the bridge would be only as a string of flies on a heavy wash-line

## Continuous Boulevard, Long Island via Manhatt to Jersey

One notable advantage of the bridge which will commend itself very widely, is that it would do away with the present irritating congestion and delay which trucks and automobiles have to endure in getting across the Hudson River a The slowing up and whicks for the purpose of paying toll could be avoided by making highway traffic over the bridge absolutely free from tells. It is estimated that the automobile traffic alone over the bridge would exceed 6,000 000 oars per year lis capacity for motor truck transport would be very great this is estimated at 100 000 tons of freight every 24 hours

#### Classifying and Distributing Freight

The idea of a classification yard on the New Jersey side is an old one and its advantages are evident. Under this method the different radioads would send their frisiph into one yard, where the cars going to the same destination would be conshipted into separate trains and destination would be combined into separate trans and sent to their local stations. Conversely, returning empires would be made up into trains for dispatch to the property of the sent of the sent of the sent of the the Manhattan aids of the Stifter they would pass down the clevated railroad on West Street and, ultimastly, when the system is extansible, would continue up the East River front. The sewerage haul to and from this clavated structure for stone disturys would be from onehalf to three-quarters of a mile

It is evident that the Hudson River bridge at 59th Street, and the tunnels from the Battery to Jarsey City for emply returning cars, would offer a circular system of transportation of great capacity and elasticity for the handling of every kind of freight. The marginal elevated railroads, moreover, would be associated with a system of warshouses manufacturing lofts, market halls and freight stations, which would be located alongaids the elevated structure. The freight could be delawared by gravity to attent level and there picked up by motor trucks for distribution. Although the bridge would cost about \$75,000,000, so

great would be railway track capacity that it would take 18 tunnels to provide the same amount of accommodation It is perpetually reiterated that a tunnel is much cheaper than a bridge. As a matter of fact, compared on the basis of capacity, it is very much dearer

#### Question of Financing

Speaking on the question of financing, Mr. Lindenthal told the Commissioners that as the result of a thorough investigation of this question for many years, he believed the interests of the public would be best served by a separate terminal organisation acting as an agent and trustee of the Federal Covernment, and that such an organisation with large capital is in process of formation Because of the multifarious advantages conferred, not Because of the multifarious advantages conferred, not merely to passenger and freight traffic but to the automobilists and to real estate and other interests, particularly in New Jursey he is satisfied that no public funds would be required and that private capital will willingly come forward to build, equip, and operate the entire improvement, when once it is sure of the joint cooperation of the railroads, the Cily of New York, the communities on the New Jersey side, and of the United States Glovernoon.

#### Lead Poisoning from Nursing Bottles

Lead Poisonning from Nursing Bottles
FOR several years muring bottles for indate have
been made of a kind of glass known as crystal metaed
ordnary glass, because the former is much tougher
and, therefore, less liable to break during the process of
strellastion. A few weeks are a Franch physician,
Dr Guerbet, made the startling statement that he had
found that a case of chrome possoning is an minart three
months old was due to the lead derived from the glass
in which the minart's mulk was strellased. Ordnary glass
does not contain lead whereas "crystal" glass constains a
town of the startling of the strellage of
contains and the startling of the strellage of
contains and the startling of the strellage of
contains and the startling of the strellage
I see well known fact that when salt water is estellaged
in crystal feaths lead childred is formed, even if the content of each is only nine parts in a thousand. Dr Guerbet
to deal to only nine parts in a thousand. Dr Guerbet
believes that a milds notion cours through a slight
aliaintry of the salt on the shlorides it contains

alkalatity of the milk or the shlorides it contains. While the amount of lead thus denotived of the milk would, of course, he very small, it might easily become injurieus in the course of time since lead is what is income as a cencu-lative spiceo, it is, instead of being immediately ellim-nated it socurables in the tissues until a sufficient quantity is present to soft as a servous poison. Dr. Courtest gives no far as to demand the peames of a layer forthidting exystel giant to be used in the canantisation of making the contract of the place wave conjupted for continuous

#### The Part "Engles

AS part of our naval polity against the U-boat is was A decided to build 100 steal reasels of about 500 tons displacement and 18 knots speed and displate them to European waters They were of a mongred design, unlike sarything existing here or abroad, indeed, in naval eyes they were saither "fish, fiesh fowl nor good red hering." To small for service on the high seas, too slow for effective sub-

herring? Too small for service on the high seas, too slow for effective submarine hunting, wedge-bowed and slab-sided, they are an object-lesson in the folly of political and layly technical matter as that of determining what kind of vessels should be built for naval purposes

For it is no secret that these boats were built against the advice of those naval officers whose duty it is to determine what are the needs of the Navy and what kind of vessels will be see including the secret of the Navy and what kind of vessels will be see inceed of the Navy and what kind of vessels will be see including the proposable for these nonde script craft, nobody seems to know, but the recent hearings before the House Naval Affairs Committee developed.

the following facts

1 That a total order for 110 of these boats was given
to Mr Henry Ford, or, to be more exact, to the Ford
Motor Company

2 They were to be paid for out of a \$100,000,000 Emergency Fund, known as the Presidential Emergency Fund 3 That the contract price was \$275,000 per boat, and

3 That the contract price was \$275,000 per boat, and that there was to be a fixed profit of \$20,000 on each 4 That (according to the testimony of Chief Constructor Admiral Taylor) they have cost at least \$400,000 per boat, and that the armament will add \$110,000 to that sum

that sum
5 That Ford put up a shop 350 feet wide by 1,400 feet
long in which to build the boate by 'Ford methods,
and that the Government furnished \$3,500,000 to finance
the job.

the job

8 That when the armistice was signed, only seven
boats had been completed, that five of these had started
down to the Atlantic, and that they only got as far as
Queboe, where they were frosen in for the winter
We understand that the contracts for 50 of the 110 have

We understand that the contracts for 50 of the 110 have been cancelled and that the other 60 are to be completed Good looks we are bold were sacrificed to speed of construction. The above facts show that we did not get the speed, and a glance at the photographs shows that we certainly did not get a natural beauty. The man armament consists of two four-inch guns, one mounted forward of the bridge, the other on a deck house

aft. There is an anti-aircraft gun on the quarter deck. The picture shows that the Lagles can do some lively rolling, even when the sea is in a peaceful mood, what their auties would be in a fresh breese and a lively sea can be left to the imagination

And what a gun platform!

#### The Battle-Cruiser "Repulse"

OF the new shape, built for the British navy during the war, none have created greater interest than the Repulse and Renown. When the war started they were included in the 1914 program of new construction. These two and another shap were included to furm part of the Royal Sovereign class shape of 25 750 tons dis-



One of Ford's "Eagles on her trial trip

placement and 21 knots speed. On the outbreak of war at the matance of Lord Faher a string advocate of the battle-cruiser, the plans of two if the ships were redrawn on battle-cruiser lines.

on battle-crusser lines
Persistent reports of a semi-official character led to
the belief that these ships wer consolrably over Section
and 38 knots contract speed. If the London Pagemer is
correct that is an over-stat most and the leight is
slightly under 500 feet and the intra taged dwas about
31½ knots—the highest speed on trivial ring 13 knots
The armor is light and disposed on a nivel plan pretection against anxions by guinter, and torprobe bring
secured by an absolute system of c friendes and subsecured by an absolute system of c friendes and sub-

we prosent what we consile the the best photograph of the type which has reclied the side of the water. They are shapely week in with a 15 few attacks one being of moderate high the target acknowledge being of moderate high the target acknowledge being of moderate high the target acknowledge being of moderate high the target for shape of this great size. The bright cinear being for the size of the s

A novelty is the adoption of the II enterline position for the torpedo battery of 18 I i ch gins which are mounted in three-gus shield m into join to the rear Also the director fire principle his leen applied all the gus being trained and elevated from a single fire control

station by the fire-control officer. This method has been in use for some years for the main batteries and this it he first time as far as we know that it has be napplied to the secondary batteries. The results have given great satisfaction.

The bull of the ship f rward is marked by a pronounced flaring out of the bows it vowater a doubtful advocage as it results in

fill advertige as it results in heavy 1 inding if the ships are 1 in hard into head s as 1 is stated that the vessels 1 ve had to be strengthered by extra bulkleads amidships to meet the bending stresses.

These two futtl crussers full on the Civic in 17 morths assistic a record for right construction of capital ships

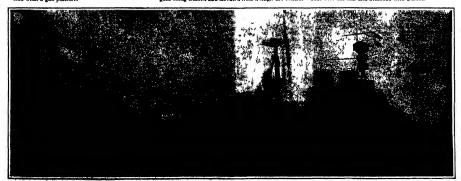
#### Substitutes for Platinum

THE question of substitutes for platinum has received almost world wide at tention many nations having been obliged to devise some thing. Most of the platinum raine from Russa before the wir. Germany was no exception. Some of the recent unstitutes are compensed in a

carriant as ema to be that suggested by cartfield Furbs of Brine consuting of a wolfram gold neckel alloy which can be east forced and rolled is of a light color and polarise origidity which platinum does not. Another substitute is an alloy of silver wolfram and nickel Soth these alloys are stated to be aird resuiting. A nickel rion alloy,

an alloy of silver wolfram and nickel Both these alloys are stated to be and ressuring A mickel rion alloy, known as platinit is said to be servicable as a substitute for platinium in glow lamps its conficient of extension bring similar to that of gloss. For laboratory purposes an alloy of nickel and chronium affords a platinium substitute for wire and sheets but could alloy such as cobalt iron and cobalt chromoum, are as servicable especially for and resisting purposes. According to the formation to the formation chemical paper (hemiker According to the formation chemical paper).

According to the current retermines paper the susceptibility and the control of t



M.M.S. "Repulse," a hetile-seather, 489 feet long with apoul of 23-23 knots. Carries six 15-inch guan. This ship was built in 17 months at beginning of war

# World Markets for American Manufactures

Edited by LYNN W MELKINS

A department devoted to the extension of American trade in foreign lands

#### Expert Exporting

Some Suggestions for the Middleman in Foreign Trade By an Exporter of Forty Years

THE house that I uve all over it United States and specific and I will be shall all over I stin America is a middle man—an export middle man. N with middle man is the fellow whom nebody loves the manufacturer is always frying to channed him and the foreign bayer would be glad to avoid paying, the commission on which he exists so the right of the middle man terry in his business is all comprised in the or will serve.

One kind of serve class tid with packing and marking.

A g y all rad has been said on the subject of packing

against the rig rs of seath American stevedoring but there is one aspect of the subject that has been little touched upon I very exporter should remember every laws ar always on the job and that they are administered without four or favor

In particular he should remember that duties are usually in the gross weight but that the rates are arrived at by reasoning what would be a fair impost on net weight. Accordingly the importer annut afford to have his packages made at y more secure then necessity demands in filling a large order for lades stockings the erments came from the inct as in cardboard haves that weighted as much is the stockings themselves and in these because they were again packed in wonden enses that weighed 100 pounds. The duty would have been tremendous to say nothing if freight at 50 cents per cubic foot. We eliminated the cardboard boxes cubic foot. We climinated the cardboard boxes and the packing cases and the the stockings up in bales, hydraulically pressed. In this way we saved the Salvadorean customer 75 per cent on his fright bill and an incredible sum in duties giving him real a rvice that he could afford to pay for

In another case where the outcome was less happy the victim was hunself to blame. In happy the victim was binned for blame. In this country on a visit he bought is handsonic safe for his home office weight our ton or threabouts. Being of an economical turn of mind he perchased a fine line of silks handser-tches shaved etc. and pricked them in the safe to save shipping and pasting; harges. But the made out his consider movie in such a way that he left the home ustoms officials no

that he felt the home ustoms officials no alternative other than to nitespie it he safe as the container for the silks so his duty bill read, gross weight 1 1000 kilos at \$4 gold by r kilo \$4 000 gold! He kirked but to no avail he refused to pay and his safe and his silks were said at public auction pay and his sate and his wise were said at phone aircrain. Had a similar error been made by the American exparter, the house would of course have had to stand the loss

the noise would of ourse nav. and to stand the loss As important as the picking is the marking Of course the middlemin should always pack his goods under his own brands selecting a short name with a picture so that the illiterate native can demand the goods by asking for the bar or the herse or the palm goods by asking for the bear or the herse or the palm in a few years such a brand will have acquired a very real money value but the marks must be used with the greatest of judgment especially when it comes to a question of pames. Now it is a delicate touch to brand question of names. Now it is a delicate touch to brand the purchasers in one on his goods—provided he wants it there. But if he himself is a middleman he doesn't want it there because his customers don't want it there he would have as much difficulty disposing of goods bearing his own name as he would of goods marked with

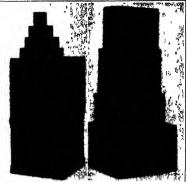
vours Norstailer is going to let the wholesale radyertise himself at his expense if he can help it I well 1 well remember a ship sugar-pine boards made to Buenos Aires with our name stencilled name name in big letters as The consignee

men to scrape our name off the boards, charging the expense to us. It amounted to \$150, and we had to pay it We had been too anxious to serve ourselves, mate and of our customers.

If marks are to be used sparingly when they betray the source of the goods, we cannot make the destination or the route too plain. If the goods are in straight wooden cases they should be marked as follows

> 8 del C BOGOTA GIRADOT BARRANQUILIA NEW ORLEANS

The initials must be four inches high and the towns two inches. This shipment speaks for itself, it shows that it goes to New Orleans, theree to Barranquilla by



Tallow and tea for transfer across the Andes In each instance the indi-vidual containers are shown on top of the pile of cases

ses, to Giradot by river steamer to Bogota via rail and mult. If the goods are in below with iron hoops, do not try to stend the shipping marks on the burlap surface they will not show up. Get a printer to print them on prece of cotton cloth, and fastir these under the steal The loss avoided on one slupment gone astray will pay for years of such marking moreover goods thus will pay for years of suon marking moreover goods thus marked when identified to port officials by pilotographs accompanying the documents indutually get to their destination weeks or even months ahead of those that are left to take their chances in the regular course of

Another important consideration in packing is the size of puckages Labor in Latin America is all by hand, and the native workers have little muscle and less energy that should The heaviest case of 120 pounds be nicely handled gross This can

by one man or by two, and two of these cares make a good nule load. But if the goods are to go where trans-portation as va liams they should weigh but 50 pounds per piece, since the limit for this animal is 100 pounds, properly balanced

Nor is also the only feature of a package, it may be susceptible of improvement in many other respects Dried shrimp had for years come from Mexico, for re-export, in second-hand sacks of any old size and weight But when we got a big order for these shrimp from the mines in Chile, the price and the freight were such as to make it certain that the buyer would expect to receive every pound he paid for So we repacked the shrimp in neat wooden cases, with a brand, and now we get all the orders We repeated this performance, with similar results, in the case of tallow, which had always gone out results, in the case of tailow, which had always gone out in old oil-tins that were in poor condition when they started the trip, and which we shipped in heavy tins, specially made, and each incased in a wooden framework

When you have got the goods all packed and When you have got the goods all packed and ready for shipment, you have got to supply your customer with invoire, bill of lading, and insurance policy. Dont is too there, try to think of something else that be could use and that you could give him. One such thing is photographs. You can, for a couple of dollars, supply him with a couple of dole me pretures of his shipment, pictures that will show the handlers of the goods en route what they are, pictures that will show the buyer how the goods are coming to him, pictures that will show his customers what the goods are and how they are coming to them After doing this awhile, you will be surprised to discover what a big selling the surprised to discover when a sell your customer and they sell him indirectly by selling his customers. When a man is forced to buy goods without ever having seen them, the goods without ever thaving seen them, the possession of photographs telling him how they are to be packed right down to the outside case, as a fremendous comfort to him

Similar in contact but somewhat different in puipes in the provision of documents that will show beyond question that your goods left the pier in proper order. A well regulated sugar refiner is always glad to have an outside chemist inake an analysis, as it gives him a check on his own factory, but a sawmill turning out box shooks by the carload is not always so careful as to measurement or count when they know that the middleman who pays the bill will the goods The \$10 per car for a Chamber of

Commerce expert tally is here money well spent Such goods may not reach the constimer until they get to Lima or La Paz thousands of miles away and th to Lims or La Paz thousands of mies away and unou-sands of feet up. Then they may not be just what was experted, and what are you going to do about it when the consignee refuses to pay? You can it do anything— unless you have your Chamber of Commerce certificate, unless you have your Chamber of Commerce certificate, with a clause in your contract providing that this certificate is final evidence of quality and weight of the shipment I have seas thousands of dollars saved in claims by proper attention to these certificates, and as many brousands lost by failure to have them They are not to be thought of as a means for beating your customers to be thought of as a means for obscuring them. They make it possible to any just where the trouble flee, and in particular they make a proper than the property of the proper ticular they make it certain that you will get back at your wholosalers before the evidence of their faults has passed

> A case in point relates to our exparience in ship-

> out of your

ping California dried fruits in large quantities The staims for short weight, bad quality, im-



Left, wine in kegs for mule-back transfer, before and after the water casing in put on. Couter, dry-gs Right, the effective way to mark haled goods by means of a printed cloth label inserted by

# Future of British Flying

#### What the British Government Is Doing in Preparation of the Coming Civilian Aviation By C. H. Claudy, Special Correspondent of the SCIENTIFIC AMERICAN Now in London

EVERY one realises that the war has forced a hot house development of sylatron, which has accomplished the technical and constructional advances of 20 years, in the past two What apparently is not comminment the technical and constructional advances of 20 years, in the past two What apparently is not generally recognized, is that the greatest advances have been made, not in France, not in Italy, in spite of the Caproni and its wonders, not in the United States, for all know no other country could put a satisfactory high-horse-power, low-weight engine in production, but in

The development of the flying machine, the flying machine pilot and the flying machine factory in Great Britain is something which

positively staggers imagination I hope to tell at least the main outlines of that enormous accomplishment later, if for the time being it can be assumed that the size of the industry is enormous and that only the armistice prevented its flowering to proportions at least double the capacity the United States talked about and did not achieve-20,000 engined planes a year-a common ground can be reached whereby we may consider that the future of British aviation is not unhkely to be the future of the world's aviation Certain it is however doubtful that may be to some Americomanuace, that the States must look to its air industry, its air laws, its civil aerial transport look quickly or Great Britain will have forgod as far ahead of us in this utilisation of this greatest of gifts of war to peace, as she has in her war sviation program It is too early as vet to

spoak with any certainty as general and the United Ling-dom in particular is going to go ahead with the civil sorial transport idea. It is pointed out on every side pointed out on every side where that question of "what" and "how is asked, that "we are still at war and no one knows until oe is actually signed, just what sort of an army or naval flying establishment we shall have to maintain It is also pointed out, although this seems less obvious to the man in the street, that no resumption of the hit or miss civil flying of the old days is possible with the new far, fast and highflying planes in abundant supply, that new laws must preceds civilian flying and that an international agreeon international laws should precede local laws, and that no international

convention on air laws is likely to be formed until the peace conference has finished its work

finals die work
But if the particular "why" and "how" and "what"
of future Bettish civilian flying is as yet indeterminate,
there in achting wages or closuce about the preparations
made agetiset the time when passes and laws duly made
and passed make possible the beginning of the great
development of cavil serial transport to which Britain
looks forward.

To begin with—and to get a long way, with as far as
that agett [—Chark Britain's behaviled assessment.

num norward. To bogin with—and to gn a long way, with as far os it goed!—Cheat Bricain's forchanded government aplated a Civil Aerial Transport Committee nearly two use sign—in May, 1917—with the sweiged object of

considering and reporting to the Air Board (since replaced by the Air Council) regarding the steps to be taken to mark the development and regulation after the war, of aviation, for purposes both civil and commercial, considered first from the domestic second from the national and finally from the international stand point and to agertain the extent to which it would be possible to use both trained personnel and existing aireraft which might be, at pen in excess of the requirements of the army and navy

In the language of the United States it was 'some committee, and it turned in some report Reference

report made some time ago. So far it has produced no report made some time ago so tal it has produced no result governmentally other than discussion and no ono in the Air Ministry ventures; it diction as to what the Cabinet is going to de with t. Cat on with the war has been so long at mee the 4 gain and the excussion for anything and everything over here that now that there is no war to get on with and a peace discussion which seems fairly likely to take the governments best attention for some time the government is a bit loathe to jump right into anything as big as a civil scrial transport scheme even though a hard working committee has drafted out the whole plan ready for action

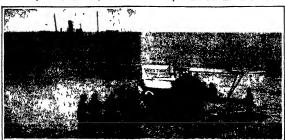
But the report and the discussion of it have had one very far reaching effect-they have turned many minds to the question and much soler thinking and carnest discussion have taken place Also the industry itself which was suddenly, like a bolt cut of the blue faced with dire consequences on November 11th his had a hance to look bround and make plans and consider the possibility of continuing or changing itself, with the changing itself, with the feeling of anxiety and less of pame even among airplane workers

I rom the discussion and the thought as one catches it here and there in talks with this governmental official and that secretary, that clerk and this sirplane constructor, this minister and that technical man, come two clear cut ideas. First under must Britam - minense industry, as created by the war, be second equally impossible is it to force a growth of ivil actial transport merely because one has factories and planes and aviators a most homely comparison. we had roads and horses and we had rouds and horses and wagons and mon for years before we had rural free delivery. When we got it, we got it little by little, bit by bit and made a success of it. So must it be with any well rounded scheme of civil serial transport—it must grow as fast as the public

If the two ideas seem incompatable one comes readily to the third which is gripping every out a attention here government interference, government in control government monouply government participation government subsidy of civil aerud tiansport Some say one and some say another, but nearly every one, in the Air Ministry and out of it, in the trade and out of it,

seem to think that only by some sort of government aid can the big industry be kept alive with the war stimulus removed, until the peace demand grows up to the capacity of the industry

This seems reasonable though Unquestionably, the industry is going to be allowed to exercise to its follost capacity the natural shrinkage which it will admit capacity the natural saturakage which it will admit voluntarily For instance there are many plants which are conversions—which were automobile factories or sewing machine plants or button futories, or furniture factories, which turned their facilities to some part of airplane making, when it was realized, two years ago, that (Continued on page 270)



Scapiane accidents such as this one are rure. Indeed, it is generally held that the scapiane is best adapted to civilian flying



These forty men and women were recently carried aloft by a British Handey-Page bombing plane, indicating its peace-time possibilities

is not made to the distinguished personnel, although such names as Northoliffs and H G Wells ring familiarly upon American ears It was a great committee because it did a great nicee of work

It divided itself into five broad divisions, and rendered It divided Red like has been divisions, and rendered at least one, and offerer more than one report on each of these subjects. They are first Law and Policy second, Technical and Practical Questions Relating to the Arrea't Industry and Amail Services, fourth, Labor, and fifth, Research and Expert Eduration. This comprehensive scheme has been followed in the

most exhaustive manuer and a complete and printed



# **KELLY-SPRINGFIELD**



Part of DuPont flost, Newark N J equipped with Caterpillars



 $40\times12$  Caterpillars on specially constructed Pierce-Arrow in Boston, carrying daily 10 tons milk and cream Mileage when photographed, 4,500. Beving of gasoline one mile par gallon over other types of tires



40 x 12 Caterpillars on 6-ton Packard Road Sprayer operated by Creasey Contracting Co Boston



40 x 12 Caterpillars on 5-ton White in Cleveland Mileage when photograph was taken, 7,000 miles



46 x 12 Caterpillare on 5-ton White, operated by Perfection Spring Co., Cleveland. Mileage when photographed, 8,000

OVER the hill of traction progress has come the massive Kelly-Springfield Caterpillar Tire for Trucks—the greatest advance in solid tire construction since the beginning of the industry.

Its elephant-footed sureness and lasting economy have immediately appealed to the heaviest truck users in the world. By a series of side air pockets—a new construction fully patented—it gives maximum traction, road contact and resiliency, with minimum vibration and vehicle depreciation.

The pockets permit the rubber to flow under load, take up the traction wave, reduce internal tire strain, and keep the tire cooler at all times.

As a new force in world industry, the Kelly-Springfield Caterpillar Tire has taken its place among the mighty

Kelly-Springfield Tire Company

4614 Prospect Avenue, Cleveland, Ohio



Burns Bros New York entire fleet of 59 trucks is equipped with Caterpillars



40 x 12 Caterpillars on 5 ton White operated by Standard



40 x 12 Ceterpillers on 5-Ton Packard Seems to how no perceptible wear. This tire appears to be the soluti n of our tire troubles. Never before had a tire on this truck it at has any where near run its guaranteed mileage. Glescoster Coal Ce



This truck has been n acro ce has ng I ve to seve tone delly and the tires show such little wear we believe they will last at least

# CATERPILLAR TIRES

# The Motor-Driven Commercial Vehicle

This department is devoted to the interests of present and prospective owners of motor trucks and delivery wagons. The editor will endeavor to answer question relating to mechanical features, operation and monagement of commercial motor relactive.

#### Condenser for the Cooling System WHEN a truck does hard work VV especially on low gear the water in the cooling system tends t heat up toil

and steam and consequently consider ably water may be better a satisfing extra trouble and memory in C in filling up. In summer this kind of trouble is aggravated by the hot weather and in writer when easily evaporated un-freezing solutions are used the loss may entail const l rall pense in addition to the trouble and delay

An I astern manufacturer of ters means for eliminating or at least minimizing such froub les in a ministure condenser which is placed on top of the ordinary radiator cap the forced to pass upward through a provided with flanges to increase the radiation of heat as the tubes and flanges are exposed to the currents of air the coshing to the currents of air the cooling effect actually is considerable life vapor is condensed and drips back into the radiator in stead of being disappited in the air and altogether lost. In ad-A miniature condenser to dition to the model illustrated, which is intended for large trucks radiators are made for small tracks and for passenger cars In the latter ease the cooling element is simply a coil of plan thin-walled copper tubing

#### Easily Loaded Low-Hung Trailer

L OADING and unloading heavy ma ternal often is difficult and wasteful of time when it has to be handled to and from the platform of a truck or trailer of ordinary height and time is more; An appreciable saving is effected when the height is materially reduced. A manufacturer in the Middle West who makes a specialty of trailers has brought out a semi-trailer with the loading platform dropped well below the level of the for ward part which rests upon the rear end truck or tractor with the usual turntable coupling arrangement

The semi-trailer is of 5 time capacity and is designed for use with a truck or tractor of 1 2 or 2 tons nominal capacity there is a clear loading space of 16 feet at the low level, and the platform is but 34 inches from the ground. The trailer illustrated is equipped with a set of lever operated rollers by means of which a load of lumber can be dumped intact and left on the ground in a fairly neat pile For this particular work there is the further advantage that the short distance of th drop is less destructive to lumber than a longer drop. The work of dumping is made as easy as possible by fitting the rollers with roller bearings. The saint concern builds trailers to carry up to 10

#### Good Roads and Gasoline Rills

OME time ago we carried an account of tests made in California to determine the tractive effort required by arrous kinds of road surface and we illustrated these findings by means of a chart showing the number of horses that would be necessary to haul a given load over the various roads involved This was all very well, so far as it went but it did not lay a great deal of em-

the Missoure Highways Transport ( omnuttee has just given out a series of good roads pr tures and diagrams, one of which translates the California tests so admirably into terms of dollars and cents that we are impelled to add it to

The state of

take the place of a radiator cap

our previous discussion

in question reproduced herewith shows

the amount of gosoline that will be con-sumed in running a loaded automobile for

20 miles wer the several types of road which figured in the tests. A fuller

CONC 421 Cals for Lors Grave 50 Gala for Mud Top Gale for Dust To: Packed Crave Topeka Top

The cost, in gasoline, of a 20-mile drive ever good and bad roads

The diagram

load It is assumed that the automo-bile loaded, weighs two tons, and that in delivering one horse-power per hour to the drivers the engine consumes I 2 pints of gasoline per hour. The gasoline con-sumption for the different surfaces then

vibration of motor truck service, remains valutation of instor truthe service, remains and often causes trouble. One radiator manufacturer has succeeded in making a radiator in which 50 per cent of the joints are eliminated altogether, along with 50 per cent of the possibility of joint trouble

There must be some joints, and those are made by a process which brings the parts together under such heavy pressure that they are very strong and well adapted to resist vibration. A adapted to resist vibration. A material reduction in weight has also been brought about by careful designing and distribution of inetal, without making the radiator less substantial than former models

#### Using the Truck as a Tractor on the Farm

COLORADO farmer has A COLORADO farmer nee found a new use for his motor truck. He has been in the habit of using a big tractor to haul two wheat drills, and was shle to put in 30 acres of wheat in a working day A motor truck was used to carry seed grain to the drills because there was no way of carrying it on the tractor The expedient was tried of putting the wheat on the field shead of the tractor, to be

note ahead of the tractor, to be picked up in the course of the work, but this did not work well, largely for the reason that cattle found the grain and devoured it

grain and devoured it
So the farmer tried the experiment of
using the truck instead of the tractor to
pull the drill, at the same time carrying
the seed wheat along with it, and the
result surprised him According to his own statement, he covered just as much ground with the truck and one drill as he ground with the truck and one grin as ne and with the truck and one grin as ne did with the tractor and one drill for other work and eliminating a good deal of trouble besides. It was also found that the truck packed the soil less than the tractor would see in that the truck, following the suggestion thus brought forward, might well become an unportant feature of the farm machine equipment, doing in addition to what is ordinarily recognised as its own work, certain jobs that fall he-tween the province of the tractor and that of the horse or the unaided man



A low-hung trailer adapted to han! lumber at a great saving of time and money

statement of just what these types are will be found in our issue of January 5th,

in preparing this diagram, the Cali-fornia figures are taken for the pounds of tractive effort necessary per ton of

Motor Truck Radiator for Rough Work

becomes a matter of mere arithmetic, and

of the roads will immediately

A motor truck radiator in which

50 per cent of the joint

MOST of the troubles that beset the radiator of years gone by have been climinated but the necessity for using timi-walled tubing which is prone to let go at the joints when subjected to the



Using wing flows to widen the swath cleared by the snow plow

#### Clearing Roads of Snow

BREAKING out country roads after a heavy snowfall se by no means an easy task, nevertheless, it is something that must be done in view of the fact that road traffic has assumed greater materials than at any time in the past Motor trucks require good roads for their efficient operation, and the roads must be

kept in proper shape regardless of seasons.
The power of a big truck is more than aufficient to push an ordinary plow through ordinary snow, so wing plows often are added to mersuse the width of the swath cleared. The illustration shows a truck built by a well known middle western concern fitted with such wings, in addition to the ordinary plow wings, in addition to the ordinary plow at the front In order to clear telegraph poles, trees, fences, bridge railings, etc, as well as to allow vehicles to pass, the as well as to allow vehicles to pass, the wings are arranged to host to any desired angle. The crew of the snow-plowing truck consists of five men, the driver, a man to operate the front plow, a man for each wing plow and an entire helps. The truck can make a signific of from three to all or or even miles as four, according to the depth and the density of the snow.



"DESPITE running for 3 years and covering 40 000 miles, the original set of four Goodyear S-V Solid Tires are still doing good work on one of our 1-ton trucks They are economy tires "—Charles W London, for The Baltimore Chair & Furniture Company, Baltimore, Maryland

THE set of four Goodyear Solid Tires mentioned above cost \$149.70

Consequently, they have served at the astoundingly low figure of less than a tenth of a cent per tire-mile

In addition, this company reports that Goodyear Solid Tires on two other trucks are demonstrating the same kind of wearing qualities

Users of Goodyear Solid Fires frequently report mileages ranging from 20 000 up toward the sore reached in this case. Their economy is the firm basis of their widespread adoption.

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO





264

"It is less costly to buy a good belt than to suffer from a poor one."

### Machines cannot make leather belting Machines are only tools requiring human guidance

If a thousand hides should be photographed like the one above, no two would be exactly alike, either for size or thickness. And that is why it takes trained men to make unstandardized material into belting device to hasten the work of reclamation which shall be uniform and reliable.

# Jewell Belting

is made by men so experienced that their judgment of leather is second nature, with a skill in handling it which can come only from years of training. The best possible belting can result only from the best materials, perfectly processed, and fashioned by men of consummate skill. That is Jewell. There is a strength for every drive, and a form for every purpose.

Please mrste us



ties he in more or less complete run, and it is generally accepted that the state of destruction is such that the existing structures must be rased to the ground bafore reconstruction can begin

The Cermans have done their work well The Cermans have done their work well and thatoughly from their standpoint. Their afternit to cripple France industrially for years to come has been carefully thought for years to come has been carefully thought and systematically wrought for instance factory structures of steel have been flendably collapsed by sawing through most of the supporting steel columns and then wreeking the remaining supports by means of small charges of explosive Buildings of brick and stone have been tumbled to earth by clock-work-operated mines Radroads have been destroyed by explosives leaving a mass of twisted stor and huge craters in place of smooth rails and a level roadbed. Nothing so aptly describes the condition of the northern mining districts of France in the region of Lans as the aftermath of an appalling cattle as the intermeter of an appaining earthquisk. The roads are lined with tumbled and twisted masses of loose brick and stone steel beam, corrugated iron machiner, parts broken glass—a vast junk yard which awaits the house wrecker d the junk man

Lyplosives huge cranes thousands upor thousands of railroad trains and motor oxy acctains torches and electric are cutters and other equipment and personnel will be gare in putting northern I rance one more in order. The cover illustration of this more which has been suggested by an actual photograph conveys some idea of and reconstruction Such Gordian knots as twisted steel framework will be out by means of the axy-acetylene flame

#### The Current Supplement

IN spite of the fact that short-range weather forecasting does not always meet with unqualified success, the weather man is ever on the alert for some means which will give him the ability to make long range predictions and the public is interested in this matter hardly less than the meteorologist One rich possibility peratures and movements which because of the incomparably greater specific heat of the water than of the air, must exercise a wide influence upon atmospheric condi-tions. How do surface water temper-ature changes originate and move? How do these ocean temperatures control atmospheric pressure and winds? What weather occurs with winds that accompany a given pressure condition. These are questions which are asked and in part answered in an article Ocean Temperatures in Long Range Forecasting in the current move of the Scientific American Supplie-MENT No 2254 for March 15th The drops an oyster is inferior to his American but neverth less there is a well brither but nevertheless there is a went organized cyster industry in parts of Europe particularly in Holland, and it is illustrated and described in Oyster Cultiva-tion in Holland. The Role of the Catalysi discusses this tamely subject interestingly and makes the significant suggestion the certain imperfectly understood biological es are of a catalytic nature A expert on scientific management discusses in Science in ( acao Production the extent im herence in Cosoo Production the extent to which sound assemble principles have not been applied to this imperiant industry to the control of the control of the cost is an article of timely intenset allike to physician and layman The Cossel in the Robbin of Transportation makes close the attent to which we have largest behind Europe in utilizing the artificeal internal waterway A British authority discussed The Lubricating and Other Propersies of

Please tanging the Tangled Raiss of Theo Oily Fitms, a deld direct brought most be quildle eye in enamedator with fortains. THERI, is work for all the house, which are many other samilations. A very important contribution in the devasted pregons of France Mile after mile of the work of the same to the sam of the principal chemicals used

#### Industrial Democracy and Engineering (Continued from page 868)

democracy and what it can mean

does it strive to reach in its progress?

Obviously opinions on these points differ and we have plenty of extremets and differ and we have plenty of extremists and radicals. However, that is logical and, as a matter of fact, desirable for progress and correct development. Regardless of these differences, however, certain features are especially and persistently evident and, on the important phases, there is at least a similarity in the opinions of the conservative leaders of thought on this subject

A consideration of these main features might be apropos here, and the writer offers as a possible definition of the aims and ideals of an industrial democracy the following

-a condition in industry whe the various human factors, and especially the three main groups, the owners or capitalists representing money, the mancapitalists representing money, the man-agers or executives representing the leader-ship and brains, and the workers or producers representing braws and physical effort, each are assured correctly ap-portioned representation in the counsels and administration of the industries Second—a plan of organization under which each of these three groups can cor-rectly function in the utimest harmony

rectly function in the utmost harmony and cooperation, securing the maximum preduction

Third-an acceptance by all these groups of standard working conditions hours, practices, etc., to be followed in the industries

Fourth—an agreement as to the factors which are to be considered in adjusting the relationships of these three groups Fifth and last-a basis and standards

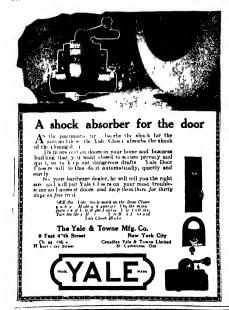
by which each group is fairly and equitably rewarded for all offort or interest, which also allows for sufficient incentive influence individual effort and progress While not dealing with all minor points

and details and probably without having brought forward any particularly new features, the writer believes these five features, the writer believes these five ideals as outlined give a composite of what is desired in industrial democracy as is desired in industrial democracy as generally advocated today Examining into these ideals and with some analysis we find the same two visions as mentioned before the chief basis. We find that bebefore the case of the way and that persides the two factors, capital and labor, a new one is interpolated, that of leadership Also, we find it each case an appreciation and realisation of the fact that labor a requirements and the individual worker's interest must be carefully and consistently provided for, not only as it has to do with financial reward but as well all other basic factors underlying our industrial system

And now, if we have established our arms

lactors underlying our industrial system
And now, if we have established our arguing ments that, regardless of whatever else
toomes in our plan of industrial democracy,
if there will be included a proper place for
leadership and control, and constrol, and
a provision for properly meeting all individualistic needs and requirements, we
t wish to offer for consideration the work,
progress and development of a group of
thinkers, students and leaders in this
socuetry, who, not only during the rigid
requirements of war production, but long
before the war started, heavy translated
of the production of the problems
invalved, as well as the development of the
hade principles which cause indeeded for
industrial structured in the significant of the southery
and more specifically to that group applicy
and more specifically to that group applicy
and more specifically to that group applicy





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#### Industrial Democracy and Engineering

m page 264) becoming known as the industrial en-

It might not be amus here to give definition of just what an industrial en-gineer is. This we will attempt, but wish to point out, of course, that the pro-

wish to point our, or course, that the pro-fession still relatively new, is not yet en-tirely standardized and the following definition can only be offered as one of several existing. The industrial engineer several existing The industrial ongineer is an individual who, by training, experience education and personal attributes is qualified to study the problems of organization personnel, equipment, buildings and all features of management and ings and in teatures of management ac-control in industrial of commercial or-ganizations (an analyze present condi-tions apply rejudies where necessary, improvements when possible and, finally establish standards which are acceptable, practical and permanent

To those interested, we suggest an examinution of the principles which have been developed by this group of engineers Underlying all their activities will be found a distinct realization of the definite establishment of properly functioning leaders and a plan providing for all those factors mentioned in the forepart of this article as scooped for a correct industrial article as accepted for a correct industrial plan. During the time that the thought of this group has been developing, and probably more especially during the last five or six years more and more the realization has come that any plan of realization has come that any pian on industrial control which does not provide an acceptable basis to each and every human factor and individual involved cannot stand for long and, honce, they have be to making considerable strates in the stady of the human problem and its many and warred sails. Standing as he many and varied sides. Standing as he does in so many cases between the capitalist and the worker the industrial engineer has become in a sense the coordinator, and it is hoped can more and more fulfill the function to the complete satisfaction of both the other groups

All this we believe will be found to prove our case that the industrial engineer our case that the industrial engineer whether intentionally or otherwise matters little has been definitely and steadily making progress toward the fundamentals of an industrial democracy and should be found a very important factor not only in the industrial readjustments and reconstruction immediately before us, in the next great step in advance that of establishing a permanent industrial democ racy. We believe the industrial engineer in this country is one of the real dyed-in-the wool industrial democrats

In any case we know that this group consisting not only of industrial manage and executives, but specialists, and con-sultants as well as educators and research students has dedicated itself to this work and we feel sure that as a result of the work done heret fore and with this as a basis for its future activities will be found in the end a very active coordinating influence with a lutions ready for the many intricate problems involved. Much has been done and now with the large opportunities ahead the next several years will see a well recognised accomplishment in these fields

#### Ticks as Carriers of Animal Disease

(Continued from page 255)

largest and finest reptile house in the I he wealthiest men on Avenue have no more commodious and well ordered establishments. In it was returtles and heards, the most extensive collection of live anakes ever brought to-gether from the ands and corners of the earth. These anakes cost much muns; and labor. First, they had to be snared by experts who literally take their lives in their hands. Then, they have to be transported long distances, often through many dimates, in an atmosphere and under conditions identical with those to which they are accustomed in their respective habitats. When they LEGAL NOTICES

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arrive at the Bronx, they must be transferred to glass houses of their own in which are duplicates of their respective environ are duplicates of their respective duvisors ments in the sections from which they came Daily they must be closely in spected. If any disease develops among em, they must have the same immediate and careful midical or surgical attendance the same experienced nursing and feeding as manl and As a miscellaneous collection of reptiles they are not merely rubl necked by the million of spectators who by large classes of students from the high schools and higher institutions as an exsential part of their curriculums, and their respective poses are of interest to several thousand would-be artists

One of the commonest diseases at the Reptile House is cancer It is especially prevalent among the anacondas and next the boss. When it starts among the condas, all of that tribe usually go by the board A huge python was recently attacked, but the disease was diagnosed in attacked, but the disease was diagnosed in time and the life of the great snake, 23 time and the life of the great snake, 25 feet long was saved She was recently attacked by ticks, but prompt efforts ridded her of these enemies and again her 12-year old life was spared At this writing, she is shedding her skin and two ulcers have been observed under the new uleers can be removed and her life again 16 men to hold this great reptile objects most stronuously to being handled Artists and spectators generally regard this python as the most beautifully colored antinul extant. Her colorings are superband blend into each other like the weave of a costly rug Boss are usually attacked by cancer on the tail the disease working upward Anacondas are usually attacked in the floor of the mouth the disease soon enveloping the whole skull. A speed, symptom is the falling out of the teeth Camer according to the government commission which investigated it, unless sereditary, can only be caused in human or lower animals by eating some animal or lower animals by eating some animal that has it. If the person or lower animal has immunity he escapes. If, however the cancer germ finds a weak spot in the intestines favorable for breeding, cancer intestines favorable for breeding, cancer results. The breeding process us so slow that the disease is usually not recognized until too late to treat it. In that respect it resembles the growth of some of the lowest fungi and probably belongs to that or n near order of plants. According to the commission noted the cancer germ is the below of the commission noted the cancer germ is attached to certain species of algae in fresh water The plant is apparently most has raged for some years among trout and nas raged for some years among trout and salmon, particularly at the hatcheries Ones the germ gots into the hatcheries, it is hard to eradicate (see government work on (arcinoma))

Mo die has recently traced cancer back to the rentiles of the Carboniferous Age era of coal formation from plants the era of coul formation from plants fossis of many reptiles of the coal era show that their derms: was caused by cancer I may have originated still sarker on earth, but there are as yet mi-older fossis to prov it. In Carboun-ferous prind casted some 15,000,000 years ago. The animals (reptiles) of the years ago The animals (reptiles) of the successors Fossils of every age since show the ravages of cancer and other dis In fact, it is doubtful if any dis ease exists in modern times, not prevalent almost since the beginning of life on earth

#### Expert Exporting

(Continued from page 258)

of giving up the line, but as an alternative we engaged the best fruit broker we could get to check up each shipment and issue a get to these up and support and these or our contract supulating that this certificate should be final. The claums ceased at once—for the packers in this country at once gave us a service that would pass our

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convicting them; so they took no pains to give us what was soming to us, and laughed at any claims we might try to make. The inspertion system stopped this loss, and more than that it enabled us to give ou sustantian the goods and the service that they wanted and hadn't been getting Similarly in the tallow transaction al

andy referred to, we found that by sup plying photographs of the shipment, with weight a certificates and chemist s certifi cates of quality we could give service and get prices that were quite out of the ques-

tion without these additional service frills. But if you are aske in spring the buyer double measure in documents, photographs and other incidentals, beware of strying to sure, bits more than he asks for an goods. I its of lases crop up where, to save a little time or a fittle trouble, or to insmust; himself into the good graces of the foreign buyer, the exporter ships a better article than the one ordered, billing better artist than the one ordered, billing it of course at the price of the cheaper goods. Don't do this your customer knows letter than you do what he wanta, and why, and if he doesn't get what he orders he doesn't have to accept the

One such case was an order for rough boards for flooring. The edges were to be tongued and grooved, but the surfaces unplaned. The lumber mill said they would have to make a special run of the order which would cost more than to sell the planed goods at the price of the rough So we shipped the planed lumber-and presently we received a bill for \$400 representing the customs differential on planed boards as against rough In another case we shipped an improved chemical reagent only to find that our ustom r had no faculties for using this in place of the older and poorer one he had been coupleying to of course he refused to pay first. These represent but two to pay fr it These represent but two
of n my possible reasons why your
cust mucrs may insist on getting the poorer
quality that they ordered in preference to
the better quality that you tried to wish

(50 tons) and verified this suspicion before shipping. Perhaps he would have paid for the 1 000 tons, certainly we would have had a lot of argument and some bad feeling if we had shipped it and tried to collect If we not shipped it and tried to collect Another Latin sent us an order for gloves intended as a gift to the President of his Republic the total value of his order would have been around \$2,000 We handled this case differently We sent him four pairs made to order after his specifications at a cost of some \$20, and we told him that the balance of the order would follow upon notification that these were eatisfactory. Of course he rose to this saturdatory () course acrose to this series. A fundament is wince to prove the course of the plant is written series in his behalf, and stating that he off before ever the plant is used, followed would let use know if more were wanted by 10 per cent a year for the next five years, I his was a lot better than shapping him his is no bouncess for a layman, but that is whole order and then trying to get his what the ship-owners have to do

Speaking of money—it takes a lot of it to swing a Nouth American export business The Latin is a notorous proorestimator, and no less so when it comes to paying than in other respects. He will demand long terms and when his account falls due he terms and when his account falls due he may pay and he may not But make no metake about this, he will pay, eventually Debts long past due, im many cases out-lawed and writin off, have been paid in full. There seems to be something at the blood of these Spanish peoples that pre-vents their ever forgatting a just debt. If the man who contexted it is so suffice. the man who contracted it sees unfoot [selfowing one gives for tunate as to be unable to pay, consbedly the will I recall one case, from Salvador, you where a debt of several thousand dellars middlenant, for everyth contracted by a father was paid by the son since fitten years after it had been charged off as a total loss.

Another point to be considered in the climate of the contracted by the contract of the c

question of hanguage. A sum our around the world, for planeaus and finglish all the time; blanch desse it. But if he goes to sail goods, of our must know the hanguage of his of Portugees in Brazil, Spanish slew; the Americas—or be distanced by h petitors I think even the m when they send a man to a foreign country, he must speak the language of that country But that is by no means all that the language amounts. language amounts to
Your customers in this part of the wor

speak Spanish while they are communing your goods, as well as while ordering them Pherefore anything that you may have to say to them in their capacity of consumers must be said in Spanish—or in Portuguese This includes instructions for setting up and This includes instructions for setting up and operating it includes encipes, it includes lots of things that each exporter must think of for himself, and which will constitute a separate problem for each article exported Moreover, your customers are going to order in Spanish, not in English Unless great care is also, in translation, heavy

losses will result One order sent to New York read 1,000 canas sebe para manas, and referred to pure mutton tallow to be burned in the miners lamps. The clerk in the New York office translate in the New 107K omee translated this 1,000 cases grease for mines, instead of lesslow and what is known as cup grease for lubricating was shipped. The goods went around the Horn to Antofagasta and over two ranges of the Andes to the mines in Bolivia, before the error was discovered In Bolivia, octors the error was cusouvered.

Then, of course the shipment was refused, and somebody paid a loss of \$20 000 for bad translation. This would have hired a competent translator for several years, and the case mentioned is not an extreme one. because the excessive costs of shipping to the interior of South America make any

the interior or south America make any error necessarily an expensive one I would extend a word of caution to the export middleman who looks forward to the day when he will salip in his own bottoms. In my opinion there is no busithe first of the same price.

The the other hand if your cleant has involving an obvious marks it will pay you viscole. It is a business best left in the use the cable to correct it. When on, hand of specialists I can recall several sustems or ordered 1000 tons of wheat we have hand to the meant 1000 quintals in the Signers, and one where the deficit supported that he meant 1000 quintals in the Signers, and one where the deficit. came close to seven places. And these were not kitings, but enterprises that had sufficiently favorable outlook to induce the investment of large sums by hard headed business men nor were the cases to which I refer due to war conditions—they are taken from normal times before the war taken from normal times before the war Strikes, secoledate, plaques, coal and oil shortages, wrecks, market changes, turned the favorable prospects into lugge losses Unless you can support such losses without being eruppled, pay the freight that is asked by those who can support them, and be happy that you can avoid them on any target. A business in whole 15 car series terms A business in which 15 per cent of the invested value of the plant is written

> When a firm grows large enough to do a general exporting business it should have ignoral exporting bissiness it should have (not necessarily on its salary list, but et its call), a firm of expert industrial chemies, an up-to-date architect, a mechanical engineer, an expect on steamers, a live-stock broker or vetarinary—in fact, a man who can handle any attustion that ean conceivably area, and some that could not possibly be preconselved. One mail helagy an amounty for a prison an superson bridge to span a tropical viver; the next savelage to span a tropical viver; the next savelage copans the subject of a tronsessed for the staughter of your closet confess slient, the Hellowing one gives forth an erder for a sughter of your oldest coffee stient, a fellowing one gives forth an erder for thoroughned Holstein bull and six sor You will be milled upon, as an engine middlenast, for swaything froup a needing an anchor, a freight leasted to give a memory, and it every instance, and many manual read ready and after to give a memory and after the standard ready and after the

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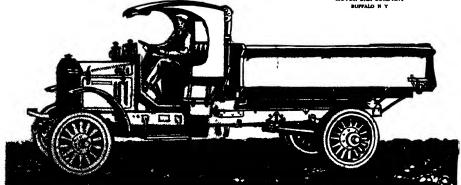
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#### Future of British Flying (Continued from page 259)

the Hun could not be beaten without he was beaten in the air and that the only way to beat him was to outbuild him These or many of them, at least will see a mose or many or usem, as seast will seek the causets path, which will not be that of watting for flying to grow to their eapselty but that of resuming their pre-war status Some engine factories will turn their facilities to other things than simplane zootors and many as workwomen, if not a more than a will resture from summer than a workwomen, if not a resign from construction rk to go to home building But with work to go to home building. But with the finatural shrinkage canouraged, the re-maining industry which wants to remain in the air industry as going to be larger than unprompted civilian demands can sup-port. Her fore easy the government ownership unbussat. It the government take over the whole industry and run at any does the thermals and the post office. as it does the telegraph and the post office

But the men in the industry will have none of it! They don't want to sell out to the government or to become a part of a monog hy Let the government help us while we need it say they, 'but let it keep its hands off ownership'

Luckily (it is easy to see what conclusion the writer has adopted as his own!) the powers that already are in the Air Ministry are against government monopoly of civilian flying Lord Wier Secretary of State for the Royal Air Force says I am convin ed that cooperation between the activities of the state and the activities of the private firms will produce the finest The state must be the pioneer it must help it must encourage it must guide it must exercise control—but emphatically it must not monopolise

What will probably happen will be that the state will be eventually to civil aerial mayigation much what it is to civil mariful transportation at the present time luglands mercantile marine is time i indiand s mercanium manne in rigidis held to certain standards by law A ship in ist not load above her plimad mark his must pass an inspection for seaworthiness. Her master and her pulot her enguer and her under officers, must have certificates of computancy She can do no thing when she carries fraight and mu h less as she pleases when she experiments with human life as passengers Her courses are marked on government charts guided by government lights and buovs and wor betide the master who goes the wrong side of the buoy or true for his the wolle and of the budy of true for all harbor against regulations as to hour and tide. But the state which demands all this which pays a mail rate to mail steamers and helps build certain huge liners that they may constitute a part of the navy in time of war makes no attempt

tae may in time of war makes no attempt to carry either passenger or freight.

This idea seems to be that which is generally held as practical regarding the coming a riral transport system. Of the mechanical difficulties no one over here makes any fuss. With planes which can land at a fixed gliding angle automatically and with directional wireless the landing and it have gaming angue accountably the last year or more of the rat and a similar control with the same part of the same pa port as the lack of governmental sites for airdrumes—amil that of course can be overn. The course of the overn. The course of th

All these questions have been taken up

Transport Committee, and presented with force and effect from both sides. Just what the government will do, or when it will do it, no one knows. That it will do something, and that soon, and that in one something, and that secon, and that in one way or another England in particular as well as the Empire in general, is about on the threshold of the greatest ample trans-portation effort of her national life cannot but be obvious to any one who sees on the one hand a mighty industry, on the other government determined to have an ampire government determined to have an empire reconstructed in every way, and particularly in an economic way and, standing between, the blat legal, social, technical, political and economic brains of the empire, all best on deviaing the best way in which the country can make the best use of her war-forged industry!

In t it about time we of the United States began to ask ourselves what we are going to do with our mighty airplane in-dustry and what part our government is going to play in our development of our civil aerial transport besides establishing a few airplane mail routes?

#### The New York Aeronautical Exposition

THE whole story of aviation is told at the New York Aeronautical Exposition eld in New York City from March 1st to 15th Not only are there to be found all the well-known airplanes of the war, with such familiar names as the De Havilland-Four, Caproni, Spad, Curtiss flying boats S. E.-5, Nieuport, Fokker and Handlev-Page, but also the forerunners of the coming era of civilian flying One leaves the I xposition with a dased sense of the recent sdvances made in aviation, even if one has

been a pretty close student of the subject With the signing of the armistice the various late belligerents have naturally disclosed their heretofore closely guarded secreta. So the exposition is replete with fighting machines about which we have read so much in the recent past. Such is a read so much in the recent past. Such its a more or less battle-worn Spad bipliane which is mysteriously canuschaged in palar gross and chocolate brown, a Britash S. E. with its curously hinged Lewis gun over the top plane, and a Baby Nieuport with its rotary engine planely showing behind the fractor strew. Then there are a second of the plane is not been sent to the second of 
Then there are the planes developed in America toward the closing days of the highting, and which were never brought to bear on the Germans Typical of such machines is the Loening monoplane with its queer deep belied body simple struts and amater black coat over all. This machine despite its unconventional deagn has broken numerous records and promised to be a vertiable terror if it ever promned to be a veritable herror if it ever reached the front here is also the Gleen Martin bomber a twin-engined plans with a span of over 100 feet—which was developed too late to be used against the enemy. This plane compares favorably with the Handley-Page which was cx tensively used for bombing purposes during

the last year or more of the war All the war machines bristle with naturally so, for there is certain to be more interest in a machine that has seen agrees than in one that was to see assube any dian't

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There is no end to the war re
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Electric Light and Egg Production

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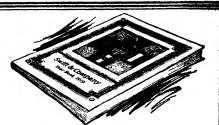
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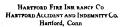
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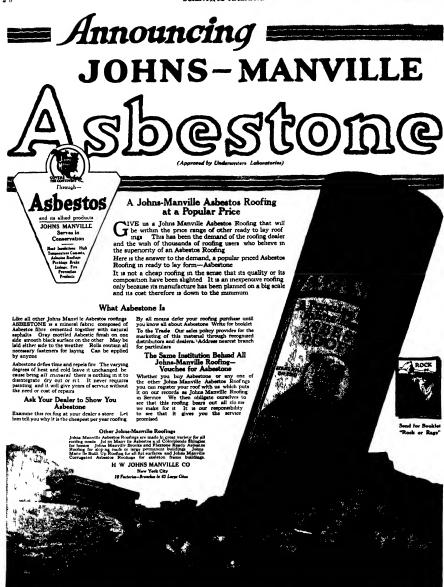
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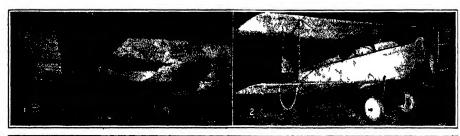
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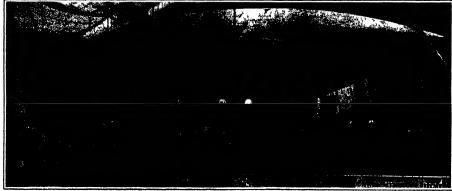
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in the order shapen the exhibits are 1—The Gleen Martin twin engine bomber 2—The Mouvenur, quort plane 3—The naval Illimp or small dirigible 4—The Gallender spanishes with Olemany Physhoci below it 5—religion and plane with Locating Baby samplane below it flower of the locating exhibits at the research Assessment Section 1.

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The abject of this junctize the exert neurately and lives lip the litest surfety in 1) real and industrial neural file day. It is not kly junctized to a position to consume superesting technologies, as position to consume superesting technologies before they are published teleachers.

The I dit r is gld t have submitted to him timely articles suit the first endumns especially when such articles are to improved by photographs

# To Solve the Battle-Cruiser Problem

HE approunce ment that the Secretary of the Navy has ordered a suspension of work on the six 15 kn it buttle-crimers which had been nuthor ised but not built brings to our nunds the battlecruser controvers, which raged so fiercely made and cutsule the Navy Department some two years ago The thice year program of 1916 called for these ships they were to make good a scrious gap in our basal defenses for at that time we had no battle-cruisers whatspeyer The British had sompleted the Repulse Renown 800 foot ships of 110 000 horse power and 12 knot speed mounting six 15-inch guns and pur naval constructors produced plans for a very remarkable ship far outstripping the Renown in all points of comparison. The new battle crussers were to be 875 feet long they were to make 35 knots with 180 000 horse power and werd to mount ten 14-inch guns The ships were to be equipped with the electric drive

the plans called for the placing of 12 out of the 24 boilers above the protective deck presumably because with such a huge horse power as 180 000 there was not room for them below dock. As our readers will remember the Sciencial American entered an earnest protest against these ships on the grounds that because f their exposed position these boilers would be put out of action when the enemy got the range. Our objection to the ships was a military one for we knew that no captain would wish to carry his ship into action with such a heavy handicap upon it. Our protest was largely instrumental in bringing about a reconsideration of the designs and the latest plans for these ships called for placing the whole of the boiler plant below the protective deck. Although the delay due to these changes seemed at the time regretable it now appears that it was most fortunate for the lessons taught by the war point to the abandonment of both the lightlyarmored buttle cruiser and the super-armored battlewhile in favor of a compromise type in which the distribution of displacement between gun armor motive power ammunition and berthing accommodation is to te arranged on the principle of give and take new type of slap has only one element which will not be interfered with and that is the provision of comfortable living quarters for officers and men for the p reconnel is far and away the most important element in the making of a well-found lighting ship

the British have abready adopted this compromise typ and the first of six closes the Hood is meaning complete. This ship may be called a high-speed bett ship or a howely amond lattle crusser just as a cycles. See will carry eight 15 mile riftes with 1 til slip amon 2 find be within 12 mile a thickness and will 1 cc speed of 30 to 31 knots. Her displacement

There is the sent opinion among our navel officers and as usual the choices of a broader, less convictional me price search with the about the befound among those the result have been already and as timely engaged in the present was which the more to necreative attitude as to be found in the General Board and among those officers who have been only the numerator in the characteristics.

there of the Secretary - Thus in favor of a compromes ship are Admiral Suns, Admir il Senson, and Admiral Mayo, all of whom spent much of their time abroad diring the war, on the other hand many of the member is of the General Board would lik to set the distinction between slow heavily armored battleship and fast, lightly armored battle-enuser in unianced

Why have the English abas loned the battle-crusser type and why are they willing 1 drop a few guns from the hattlishin sewbangs for 1 to k knots more speed and havave armor? The ansex 1 is not far to seek 1 is a found in the Battle of Juli and where there of the British battle-crussers were sank by gunfire and where a few knots noure speed would by a cambre the British battle-ships to plant themselve squarely across the line of retreat of the German Rev! 1 is own ports

Now that the threat of aggression has been removed from the high seas and the call for haste in award construction is no longer heard there is every reason why we should proved with great caution in the determination of new designs for our Nax. The history of navid construction among all nations is largely a history of preparate action leading to the construction of types of ships that were assortanted t be of doubtful value each before they left, the st ks and therefore we count it a matter of good fortune that honest and helpful critisains served to prevent the construction of our battle cruisers as they were originally designed and will result in groung as a new type which embodies in stelf the combined strategoral and tactical lessons of the recent ware.

# The Scientific Insurgent

HEN acopted acentific doctrine is allowed to tain the statuted of them does not obtain a vase in point in the attitude of the modera would through the creturins when bleeding was the one rundy for all ills, and it was forbidden even to sugars that a sufferer from fever he allowed to drink. Current doctrine is accepted because it must be true be raine if it is expected, and anyone who attempts to burst the bonds of this vieiness critical was a sufference of the superior who attempts to burst the bonds of this vieiness critical was a superior and anyone who attempts to burst the bonds of this vieiness critical was a superior and anyone who attempts to burst the bonds of this vieiness critical was a superior and the superior was a superior and the superior was a s

One draw hank to such involuted orthodox; as that the theume and doctures white I don't a orthodox; supports are not necessarily true, and by the categorical refusal to discuss them, insulated orthodox delaws their replace ment by a better creed "si long as it was forbiden to question the Ptolemaic system so long was recognition of the Copermian system impossible So long as physicians were horrified it the mere idea of omitting to bleed and held that one who, ark a fiver patient a drink was convicted of malpractice in the mere, showing of fact so long was progress in node into inhubits

But the fact that orthod xx s refusal to debate its behafs leads to persistence in error is not the only indictment against it Every scientist must have his behels with reference to the fundamentals of his science, but when he refuses to debate these beliefs to listen to arms ment of any sort, to admit that there is anything to be considered save the weight of authority, or that the questioner can be anything other than the rankest heretic this is not a healthy state of mind Modern enlightenment calls down shamt upon the head of hun who cannot afford to most objectors on their own ground If accepted doctrine cannot point to facts which contradict an alternative hypothesis or which fail to be explained by that hypothesis or which are poorly explained thereby—then accepted di trine, if it be promulgated in the modern scientific spirit will admit the alternative hypothesis to tentative standing and institute a vigorous search for new facts which substantiate or disprove one of the conflicting theores. And when accepted doctrine fails or fears to do this it admits weakness

Accordingly we have no avmpathy for the point of wire which condensus a new system, almost before it has been advanced, enths ground that it is new Of course there are limitations there as everywhere else we will not debate seriously with the man who maints that the suit is cold because as he climbs a monutarn and gets nearer to it, the temperature falls, we have been known to reason with individual entesquisars, but with the iribs we have little patience, and in general, with the advocate of a new idea who willfully blinds himself to the merits of the old we have as little patience as with the advocate of the new days who will not seen to look at the new But when a new hypothesis of any nature is advanced in a rational manner, with due recognition of what it must do to replace the old, and wide as intelligent and especially with an interesting attempt to do this, then whold that it alians attention A certain amount of mild heterodory is far preferable to unreasoned orthodory, and it is beneath the dignity of no one to read and rumnate upon the ideas advanced by the scientific insurgent.

An interesting case in point will be found in the current number of the Scientific American Supplement. A New Zealand amateur scientist of some note has built up with pains the suggestion that, after all, perhaps it is not fair to treat the moon as a satellite of the earth, which goes around the sun only because the earth about which its orbit lies goes itself around the sun He brings forward the supposition that the earth and the moon are rather to be regarded as twin planets, each with its individual orbit around the son, and each with the perturbations in that orbit raused by the presence of the other He unfolds this believentric theory at considerable length, in a most interesting manner, and with enough plausibility to keep constantly on the siert any reader who may bring to it the viewpoint that he will not admit it under any consideration. On every groun no one who is unwilling to admit prejudice need feel that he cannot afford to read this discussion

# British and German Warships Compared

ATH amazing but commendable fraultness with a first plane he made known the fact that though the German fiest at the Battle of that though the German fiest at the Battle of Juliand was inferier in numbers, it was appeare in quality. No other conclusion is possible. Apparently, it was only in ganpower and numbers that the British had the advantage, and even that was offset by the fact that the German belts carried a delay-action fuse, which caused them to burst insade the ship. The British fuses were too sensitive—the bursts occurring on the armor or while passing through it. In view of the fact that we perfected an amort-piezenic delay-action shell over 18 years ago, the revealation by Julifoos will be received with amazement.

Of equal, if not, greater moment is the announcement that the Gorman ships were greatly superior in resistance to the torpedo. This was due to their greater beam, which permitted the construction of wider anti-torpedo spaces between the skin of the ship and the interior, srmored, longitudinal bulkheads The blame for this lies at the deor of the British people, who would not vote the appropriations for building the larger drydocks necessary to accommodate the wider ships Battleships were popular drydocks were not This underwater protection saved many a German ship at Jutland and elsewhere The 'Goeben' was found to have been torpedoed five times, but her maer bulkheads he the ship was still good for 15 knots. The later British ships designed during the war, carry the "blister' or bulge - which serves the purpose admirably, as the monitors proved on many occasions

A greater area of the German ships was armored than of the British, and the average thickness of this armor was greater Moreover, the deck protection was not only heavers, but it extended throughout the altip, the British being content to armor only the magazines and other vista. Thus we bearn that nine of the saclicit British dreachoughts, including several of the battle-cruster, were without protection shore the main deck, whereas all German shaps were protected to the upper

In weighing the critecism we must bear in mind that Cilicoo has been severely critical off ront olosing in to finish the German fleet. His statement therefore is a defense of his poincy it "passers the buck" to the Naval Constructor, who, doubtless, will be heard in he own defense Until that is forthcoming it would be well to reserve judgment. Nor must we forget that the well to reserve judgment. Nor must we forget that the German Naval critic, Capatian Fersitus, recently system the Posskiet "Had the weather been clear, the destruction of the whole German Naval would have remitted."

Was Jallione over autous? That will ever remain a matter of opinion? The samely had some eighty destroyers to his forty. A night attack might have sont him enc-half his flost, and with the British command of the soa lott, the whole Allied cause would have gone by the board. The British would have been cut off from France, and we could not have seen a man to Europe.

# Engineering

Electrification of Railronds in Jealy.—During the var Iday experienced and a shortage of coal that it had to tree to water power, which is found in profusers in that county. Italy was one of the first countries to use electricity on its railroads and there has been a great cold of solitivity in that direction of late At present, projects are under foot to electrify 1,250 miles of railroad.

Manila Rope Made Brittle by Freesing.—A correspondent in the Repnarary News Record calls attention to the necessity of thewing out ropes before they are used Fall rope and that used in standing nigang do not absorb much mouture. They soon dry out and are comparatively free from dirt, so that no special precautions are required in the case of such ropes, but to 90 per cent of moisture. This does the rope no harm, but on freezing the fibers become brittle and the rope weak. It should, therefore, be thaved out before it is subjected to any heavy strain. Dirt also is apt to reduce the working life of a rope, as the grit cuts into the fibers and frays, them rapidly

Concrete Flume in Hawaii —Oving to the searcity of steel in the Hawaiia Islands during the war, substitutes for steel had to be used as far as possible. One of the sugar plantatons a concrete fune was used to carry water across a gulch. The flume was formed as an inverted siphon, consulting of a rectangular box resting on concrete columns. It is about 5½ feet with and nearly few feet deep and is supported should 35 feet above the bottom of the gulch. A bell-and-egget re-pandon joint connects the horizontal portion of the flume with one of the inclined stacks, the space between being filled with apphalto cement. This joint has operated satefactorily without any signs of leakage for a number of months.

Physhology on a Construction Job.—The supontendent of a construction job, says the Engineering Vess Racord, was annoyed to find that a crew of our-peaters did not attend to their work properly, while dirrike was periodically swinging its load one their bands. The mon invariably stopped work to watch the loads pass by A convae avaning was structhed over the earpenters' benches This was obviously no protection at all against a falling object, nevertheless, it served its purpose, because the carpenters were unable to see the work of the derrick, and although they knew that the loads ware passing over them, they did not stop and standershy to doing if the derrick should let go This device resulted in the saving of 10 per cent of carpenters' lost time

Using the Files Economically.—Quoting from Dechemaracule Exemourahoudel the Proctotal Engineer states that a file when new, if viewed under a strong magnifying glass, will be found to consist of fine points or teeth so far as the outing surface is concerned, and if passed over a pose of hard steel or other hard resistant metal it will be found that the majority of these teeth have splintered off, leaving a wary indifferent set of cutting points. For this reason it is best always to use files first on brass and copper alloys, as this seven the teeth from brassing away while the heat engendered by the working friction somewhat anneals them, and makes them fit to follow on with wrought rom and mid steel, harder steel and cast iron taking the lear place, and after those the fites want re-enting if they be that kenough.

Blancing Strength of Reinforced Concerts Beauting—The Energency Fleet Corporation, faced with the problem of constructing ships of concrete, found it is necessary to make tests of concrete beans in order destrains the proper design of construction for these vessels. As a result of the tests made, it was found that, in the case of deep beanse the standards herefolder scoephed had been too fow and that much larger shoaring streams could be used with supply. The investigation is not complete as yet, but the stabilities or far made will have an impringable theiring input the next concrete in other structures years buildings and tridges. In some case congrete jut, and bear used because of limitations in shearings straight inguesed by the steachers that have provedied as to the present them, but with the standards revised these will be an opportunishly fine a whiter use of

### Science

Whele Fat for Making Margarin and Lard.—The last annual report of the U N Commissioner of I siberies states that in 1914 Denumek used 20,000 barrels of hardened whale fat in the margarin industry. Preparations are under way in Norway for utilizing this material in the same way. The product is said to keep and taste well. Whele fat is even botter suited for making lard in this connection it is stated that experiments are in progress in the United States with fish oils to determine the possibility of making them suitable for use in the human diclary.

Medical Men in the House of Commons.—An interesting monoration in the British Parlament is the formation of a House of Commons Midual Committee, consisting of M P's who hold a medical or surgical degree or are specially interested in medical or scenatific matters. The committee, of whi h Sr Watson Cheyne schairman, is to exchange views on all proposed legislation relating to medical matters or kindred subjects, separally with a raw to avoiding the expression of conflicting medical or scientific views in parliamentary debate. He committee will also servo six connecting his between the House of Commiss and medical and there scientifies bedies Commenting on this innovation, Nature expresses the hope that eventually other branches of science may be directly represented in Parliament

The Hot Blast of Volcanoes -- Writing in the Monthly Weather Review, Mr George N Cole sets forth detailed arguments to prove that the hot blast which swept over the city of St Pierre during the eruption of Mont Pelée, as well as similar blasts in connection with the eruption of Vesuvius that destroyed Pompen and Herculaneum, the couple n of Tasl, Sakurajims etc derived its heat from the sudden compression of the air surrounding the volcano and not from conditions in the volcano itself. In other words it was not, according to this hypothesis, an outpouring of hot crater gases that caused the destruction but the dynamic heating of the sir attending the propagation of the Mr Cole eites a number of interesting explosion wave observations at St Pierre after the Martinique disaster that seem to support this idea.

The International Institute of Agriculture has for many years been carrying out within its province undertakings strikingly analogous to those contemplated for the proposed League of Nations During the continued to be a center for worldwide agricultural information, statustical and otherwise. At a meeting of the permanent committee of the justitute on November d0th last, resolutions were passed expressing ardent wishes for the realisation of the league of Nations, and offering the services of the metitute in connection with the work of supervising food production and distribution. eto, for the world at large The resolutions point out that 'during the war the Alliel nations have confederated their activities in the handling of agricultural distribution, of raw materials transportation, and finance," and that 'it may be that the League of Nations to be formed will provide for the continuation of such federated activities" If so, the League will find in the Institute of Agriculture an agency admirably organised for carrying on this important work

Marine Aigm of the Pacific Coast -The economic importance of seaweed is a subject that has of late attracted unprecedented interest throughout the world The last annual report of the U.S. Bureau of Lisharies states that, through the cooperation of a specialist from the University of California, the Bureau has been making a large collection of the marine alga of the Pacific of the from Gray's Harbor, Wash, to Sitka, Alaska Manv new forms have been discovered and the range of species previously known has been extended. The collection a to be deponted in the U. S National Museum terest in the marine sign," says the report "arises from the intimate relations existing between them and the fishes and shellfishes; from the significance of marine plants as ultimate sources of organic material in the sea and thus as an indirect source of food for fishes, and from the fact that the algae are resources useful in some case for human food and in others as the basic material for potash, nodine, gelatin, and other products useful in the arts and industries." The manne algor are still to be classed among the neglected resources of the United

# Industrial Efficiency

How Denmark Uses Industrial Films—the Danish association Danish Arbeide (Danish I alour) which was founded alout tin years ago and whose motto as Buy Danish manufactures when they at as good and se cheep as imported goods has done a gert work for Danish industry. The association has now taken into Expublicity service the showing of industrial films produced by the recently formed Danish industrial film greatest and the state of the product of the second by the product of the product of the second to be used in the achoele.

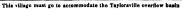
The Disabled Soldier Problem - Have you a job for a man who is trained for it' is the question the Pederal Board for Vocational Lducation is now asking the intention of the Government to assist in placing each disabled soldier and sailor, regardless of his handicap in suitable civil employment. The men are not to be dealt with from the viewpoint of giving them special soft jobs , on the contrary, the employers of America are requested to consider their employment as a business proposition An effort will be made to place each man in the occupation in which he is most interested provided it is neither waning nor overcrowded. How this is to be accomplished is discussed in a monograph, What the Employers of America Can Do for the Disabled Soldier and Sailor ' Copies may be obtained from the Federal Bureau of Vocational Education, Washington, D C

Alcohol from Lava and Peat -The present shortage of alcohol, especially for motor boats gives appeal importance to the new method for extracting alcohol from eat and lava Though lava was used for this purpose in the middle of the last century when the potato crop failed, it has muce then been neglected. Peet is found on thousands of hectares and a depth of seven to sight meters (22 96 to 26 25 feet) continues Svenak Handelsisdning From 100 kilos (220 pounds) of dried-peat substance about six liters (1.58 gallons) of 100 per cent alcohol can be obtained. This is about the same yield as potatoes The method of extracting alcohol from peat is about the same as by sulfite. The peat is boiled under pressure with sulfuric acid by which a sugar solution is obtained and some residue products. After the and has been neutralized with lime the augar solution is made into alcohol the peat residue being collected and made into briquettes for fuel. The experiments made with regard to this method of extracting alcohol have been successful and the Swedish Government has agreed to the building of a factory on the basis that the shareholders of the company should have the right to purchase and use the alcohol for their motor boats runks, and private automobiles irrespective of government prohibitions and maximum prices

Sending Trade Literature to Canada.-The attention of American manufacturers is directed to the frequent omission on their part of the prepayment of import duties on catalogs mailed to other countries They should first ascertain the customs regulations of the country to which the trade literature is addressed By ignoring these regulations many costly catalogs are either destroyed or returned to the senders American firms contemplating sending trade magazines to Canada should comply with the strictly enforced regulations governing the delivery within the Dominion of trade literature through the mails in bulk Bonu fide trade catalogs and price lists not designed to advertise the sale of goods by any one person in ( anada may be imported duty free in single copies addressed to merchants in Canada and not exceeding one copy to any one merchant for his own use and not for distribution Large numbers of valuable catalogs multid to Canada by American manufacturers have been returned undelivered owing to the refusal of the addressees to pay duty there-The total vz' ie of all of the separate pieces of matter

con The total ve! not fall of the separate pieces of matter should be first secretained and duty paid customs sips for which purpose are obtainable at the principal ports in the United States. Each piece of matter should have written or stamped on the outside wrapper or savelope the words. Duty paid "Catalogs and advertising matter sent in bulk as ordinary merchandise are also dutable.







One of the contractor's dormitory buildings on the Englewood job

# The Miami Conservancy Flood Prevention Plan

# Construction of Large Retarding Basins

By W. A. Drake

I MMTDIATTLY following the disastrous flood that inundated Dayton Ohio and the rest of the Great Miann Valley between March 23d and 28th, 1913, active steps were taken to prevent a recurrence of the disaster stops were taken to prevent a recurrence of the disaster A Thood Prevention Communities whose function was to devise some means of protecting the city of Dayton employed engineers to make a careful investigation of the underlying causes and to present some adequate secans of preventing future similar disasters. The novel plant in the hard to the work of the Chaff Engineer Dattrile is the result of the Work of the Chaff Engineer Arthur E. Morgan and his assistants

After the survey had been some time in progress it beams apparent that winter floor protection projects arread out separately by each subdivision of the flooded district would be inflicin it and unnecessarile expensive for this reason a plan of protection for the entire valley was passed by the State I (goslature and the Mismi Conservancy District was established by law in July 1915, with its office in Dayton the largest city in the flooded territory

The floods in this part of this country are not very large comparatively speaking but they are very sudden. The Same River at Paris, which is sulject to quiti serious floods carries a maximum of 89 tXXX second-feet from a

5 400

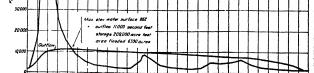
drainage area of 17,000 square inles and the floods last between one and two months. The Miann has less than one-avenath the drainage area but with floods three times as great which, as a rule, are over within two or three days. These overflows rarely average more than 100 second-feet, per square mile. The Dayton Flood caused a loss of 461 known deal and more than 886 785,574 worth of property. The total of deaths was midoubtedly numel greater, the stumate is based upon the number of bodies recovered. The stumate is based upon the number of bodies recovered. A great many projects were considered and rejectful. He problem confronting the engineers was entirely without precedent

|                                                                            | Ger-<br>man<br>town | Ragie-<br>wood | l eking<br>tin | Taylors-<br>ville | Huff<br>man |
|----------------------------------------------------------------------------|---------------------|----------------|----------------|-------------------|-------------|
| Height feet<br>Length of dam                                               | 107                 | 125            | 74             | 78                | 72          |
| orest feet<br>Drainage souare                                              | 1 210               | £ 660          | 6 400          | - 9KO             | 3 440       |
| miles                                                                      | 270                 | 683            | 26             | 1 133             | 671         |
| C rduitdes harge<br>so cad feet<br>Area submerged in                       | 10 000              | 12 000         | 8 440          | \$1600            | 88 000      |
| fi dlike that of<br>1913 acres<br>Water surface                            | 2 950               | 6 1 10         | a don          | 9 650             | 7 300       |
| spillway level<br>acres<br>Maximum at rage<br>d grag ficed like            | 3 520               | 7 9 50         | 4 02)          | 11 000            | 9 180       |
| that of 1918<br>a re-feet<br>Average depth in                              | 73 000              | 209 000        | 64 (990        | 152 000           | 144 000     |
| basins for flood<br>like 1913 feet<br>Thickness of dam<br>at average level | ж 8                 | A2 9           | 17 4           | 15 7              | 17 1        |

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March 1913 April 1913 Graph contrasting the flood of 1913 with the rate of outflow from the conservancy basin, had the latter then been in existence Not only did they have to prepare for such floods and storms as were considered the average, but for the worst possible overflows

The engineers analyzed the entire storm history and flood data of the whole country east of 103 longitude District records were insufficient and several of the ex-Datinet records were insufficient and several of the experts spent eight months in Washington abstracting the storin rainfall records. They noted all storins exceeding one inch prequipation in 24 hours, or four inches for the total storin, where the normal annual rainfall was below 20 mokes, and all exceeding 10 per cent of the annual total in one day, or 15 per cent of the annual total in one day, or 15 per cent of the annual total in the whole storin, for the stations whose normal annual rainfall exceed 30 inches. To obtain this data, the engineer divided the United States cast of the 10dd parallel into 133 two-degree quadrangles, divided on the odd degrees. Each of these was a separata storm district. About 1,500 storins wire observed and carefully card indexed. Half of them were found to be one-station astorins, the twostorias wire observed and carefully card moexed of them were found to be one-station storms, the two-to sux-station storms reached 35 per cent of the total while 15 per cent covered more than as stations. The latter received nearly all the study. The time of the storm its area and depth were all noted, and contour



ervancy plan, showing location of retarding basing

maps made and compared The research into rainfalls and floods was monumental and exhaustive All this was necessary The flood of 1913 was not a cataclysm as many believed it to have been it could cataclysm as many believed it to have been it could happen again and at say time. Although it was one of the greatest floods in centuries, certainly the greatest more the what man came, it might happen again on an even greater scale. Though unlikely, it is possible that the valley might be exposed to a storm, 20 to 25 per cent in excess of the 1915 limit. The district is working to provide for maximum floods by arbitrarily increasing upon the maximum estimated by the engineers. The protection of the valley depends wholly upon the system of retarding basins and channel improvements that are being made, so the engineers must so beyond their own or retarroing casins and channel improvements that are being made, so the engineers must go beyond their own judgment in the matter. The Conservancy system provides for from 15 to 20 per cent more overflow than is believed possible, and 40 per cent beyond the mark of March, 1913

The Miami Valley is 120 miles long from northeast to continuest and 50 miles wide. It contains 4,000 square miles at from 40 to 41 latitude and at an elevation from 500 to 1,200 feet above sea level It is one of the most important sections of the whole country from an industrial and military standpoint. In Dayton alone there are about 1,400 factories, meluding some of the iargest in the United States Recording and computing machines, cash registers, airplanes, sewing machines and tractors are only some of its products, it does much work of great wartime importance. The Wilbur Wright and the McCook Aviation Fields are also in Dayton, and the National Military Home When all this is con-sidered, the protection of the Miami Valley becomes a national problem, and it is being well taken care of

(Continued on page \$90) Fossils Found in Eastern Colorado

By Lorena S. Ellia A VISIT to the Colorado Museum of Natural History A INST to the Colorado Miscum of Natural History
In the City Park of Denver, Colo, and a talk with
the director, J. D. Figgins, regarding his recent discoveries in Yuma County of that state, takes one into

the past far as human eye can see, and then when the outmost boundry of real vision is reached the imagination keeps going right on backward into pre-historic times and sees Yuma County, Colorado, as it was when these same fessils formed the framework of living ammals, about a million years ago

Today Yuma County, in the extreme eastern portion of Colorado, is a treeless eastern portion of Colorado, is a treeless expanse of prairie with a soil of silt and sand where dry farming is successfully earned on A milion years ago it was quite different. It was thin, as was all of Colorado, a somi-tropical country with a dense growth of heavy vegetation Back in the Mesozoic era there may have been trees, but in the time of the creatures whose fossils we are considering, the vegetation consisted of a rank, deuse growth of long, succeilent grassus, a growth prolific enough to sustain vast herds of herbivorous animals without any need of

The first intimation that fossil beds existed in this locality came from H D Boyes, a ranchman living at Wray, Colo Last March while prospecting he came upon some bones which he identified as being the log bones of a rhinoceros. These he



Excavating with electric shovel for one of the

mailed to Mr Figgins In April Mr Figgins joined him and together, with pick and shovel they worked with all the sest of the early prospect as for gold. They soon found it to be more than a two man; h so a force of men with teams was set to work at pleaving and excavating As a result of their summers work there are now in the City Park Museum of Denver some acquisitions to the



Mining for fossils in Fastern Colorado

fossil collection of most much value, all of them being of the upper Misseure or lower Photone periods. Of the dog family the most wilely distributed at the the dog finnly the inst withy distributed of the families of Fiss p for it the present time the claimet species were identified one of these being—very large bear-dog of the middle Thosene—this dog approached in sire the largest of living bears, and could crush the stoutest bones with its massive teeth

The most marly complete skelton found was that of the rhancerose and Mr. luggins says they expect to find enough bones to make it emplet having about one-fourth the number now. This unmit was 13 feet long, 712 feet high at the shoulder and weighed 21 iong, 72 seetings at the should raid weight d.2. This The rimocores had a long and varied American Instory and became extinct in the lower bloome. Indiging from the present geographical distribution of animals few manimum could see in more could to North American than do the rhinoceroses yet according to an est if lished authority the family probably originated here and subsequently spread to the Old World. The collection includes the leg bones too bones and a nearly com-

Of the horse family two possibly three species were found. These were small, about the size of the presentday pury Horses were the most abundant sumals of that period, the lower Photone, according to Osborn, swarming in herds over the prairies. The evolutionary changes which have led from the primitive hye-tood changes which have set from the printitive invertors, bors up to the modern horse are many and ser el ought about, as with all animals, by changing elimitic conditions producing corresponding changes in vegetation. Of all the fossels found by these prespectors none are more interesting than those of the earnel, three

species of which were obtained One, the giraffe-eamel spaces of which were obtained. One, the graffic-earnel, was 18 fect in hight. Like the rhinocires the canel seems completely foruga to North America yet, as a matter of fact, we had this family passed through nearly the whole of its divelipment here, and did not emigrate to other continents before the late Miocene or cathe Photons.

emigrate to ottner comment.

Arriy Phocean.

Of the mastodons two species were unearthed. The parts are, however, very imperfect, being hadly broken but a complete lower new end complete tusks were mound, also two or three log bones, some

# This Mine Produces Coal and Sand

AMINING plant that is decidedly unique is located in Ohio Both coal and sand art taken from the one property strata is high grade molding sand and has an average depth of about nme feet is deposited on a bed of shah about five feet in thickness and under this is a seam of excellent coal averaging from 4 to 5 feet Shipments of sand already base been made considerable tonings of coal ilse has been much as the shift strata is uncovered by the removal of the stud, stram shovels will be utilized to strip the shale thereby exposing the scain of coal which will be mined in the open In comparatively f w localities is the coal scam sulliciently near the surface to permit of strupping The sand is mined by steam shovel and is conveyed by inme cars to a stockhouse from which it is loaded into cars by a belt A force of nine men can load conveyor. A force of 100 toos of sand a day



fitde view of a telegograp skull from the Yuma County beds



A different type, characteristic of the anhylone

# Reconstruction in Europe -- V

"Labour"- Great Britain's Greatest Peace Problem

By C. H. Claudy, I oreign Correspondent of the Scientific American in London

So may set I so multitudinous in its immlications 1 trip is many different angles Creat Britains
11 trip ish in seath in unpromaing subject for the
(10 m) (few hund) twords. And yet after having
(11 m) thousand words of repers. intersected cal many thousand words of raports interviewed as a generation of the land attempted 1 gain a projective on the Fingleth problem by Loshing at it from on American study on the frontieron of the land 
guards against the aggressions of apital. In the con-rate what British let ir wants is a continuation of the lengits which war has brought it minus the restrictions changes and alterations in existing standards which are

changes and afferstions in existing assumance with a iso the limit of the gitter to milite. In this district what any government wants for its failure is to have it seatshed with its working conditions and its wages so that there will be absence of strikes or lockouts and an internal peace of every man with his neighbor and with the capitalist for whom he works In the correct what the United Kingdom wants for its labor is a reasonable adjustment of the war promises to labor a moderate degree of patience with the inevitable upset due to the reestablishment of peace time conditions and a sufficient degree of education and compliance of mind to permit the government to carry out those reforms which have been himped in with readjustment

under the much overworked name of reconstruction
Thoroughly to appreciate the British problem two
facts must be born in used always. The first is the facts must be born in used always. The first is the extract and the variety and the power of trades unionism in England I agisuil has been since the memory of man runneth not to the countrary a country of classes That it has been in the main a peaceful one does not disprove the fact that there has been a

class war of considerable magnitude going on for a great many years. The handon for a great many years. The land-owner the capitalist the holder of rights and privioges on one suit the laboring man the craftsman the skilled artisan on the other have fought a miched liattle the other have fought a mitched lastile. The result has been a great tabor Party which if not vet in thi position of the tail which wags the dog is nevertheless of such size and power as to a very large element in politics. Hence when the government made labor a promise it was a promise not only to labor as labor but to labor as a voting power

The second great consideration to be borne in mind is that never before in the history of the empire has it been required that labor lay down labor s For perhaps the first time labor considered patriotism and country first and its own welfare and its own private class war second

the hub of the matter is right here the very beginning of the war that the only way to win it was to have no sloppage of work from any cause whatsoever So the government made a bargain with Representatives of 30 great unions held a con er with the government a presentatives in March 1915 and agreed to do certain things provided the government would do icrtain things. I abor agreed government would do return things. Inbor agreed there should be no stoppage of war work from any ause whatever. Differences in opinion as to wages or conditions or liours or anything clsc were to be settled in certain agreed upon ways but without stoppage of That was what the government wanted do manded and got

But the government in its turn agreed to require of all de contractors and sub-contractors that any departure during the war from practices ruling to work shop shippard or other industries prior to the war should be only for the duration of the war No change in practice due to war should prejudice the position of either individual or trades unions after the war or affect the resumption and continuance after the war of any rules or cust mes existing prior to the war

And now that the war is practically over the govern ment finds (I it it cannot keep its promise in its entirety, no matter ! w much it may wish to do so This is not fault of the government nor of any one else the result of conditions. Thousands of workmen have Thousands of older men boys and women have taken then places and hurned their work. For the industry of the country at once to revert to pre-war conditions and instantly to throw di these diluteus out of jobs because, prior to the wir a trades union had ruled that a certain length of the was required before an apprentice could become a cratisman and because the government had promised pre war conditions in ost-war ilays, would preceptate a cational calamity.

It may be stated with little far of contradiction that

It may be stated when mass that in contradictions some such claimity is going to take place. Labor as by no means unintelligent and can set that the government in nonwealth of a didenma. Set it is reasonable to suppose that labor will make a good bargain if it makes suppose that is now will make a good bargain if it makes a new one and this if, so to spank industry im general and the government in particular is let off some of the strict letter of its agreement, it will be at a preceding. The problem is complicated by the process of demonstration and the resultiement, at the same, turn, of all the funal belp the civil war workers and the dilutes of the latter of the strict of the

generally During the transition is nod between the beginning of demobilization and the time when the country has in a measure begun to settle lown to peace conditions employment is apt to din mish crease. At the time when there will be the greatest demand for work there will be the least work to be had Many factories must go through a remaining process scrap old machinery and get new before peace work can be recommoned. There is bound to be a shortage of raw material because all countries will be trying to got them at once and because production of them is loss now than before the war, and because slipping to carry now that below the way, and because suppling to carry them will necessarily be soant intrhermore, there is always heatation to engage in new work especially con-struction work, in the face of high prices. As a final limiting factor there is a certain amount of dislocation of business and often of disappearance of selling organiza-

tion due to the war Naturally where labor is plentiful and employment

WHEN the citizen army demobilizes its members so back to their jobs-to find these filled, and acceptably filled, by women, bays, older men, and men physically unfit for military service. One of the oital problems of reconstruction, the world over, has to do with the readjustment between these two classes. In the present article, the fifth of his series on European reconstruction. Mr Claudy shows what this problem means to Britain, and outlines the direction which its solution must take --- EDITOR

scane, wages are apt to fall. Always a difficulty where labor is converned, falling wage scales in the face of a high and mounting cost of bring is a calamity which labor naturally will resist to the end. Fractes unions will result a reduction where the will not fagit for an increase. With this fastor the government has to recken intelligently, to avoid desaster. The three principal integers in the ability of labor to enforce its demands are of concer the unimeral strength of its unions, the financial resource of associations and unividuals, and the amount of cooperation or amelicans.

individuals, and the amount of cooperation or amalgamation between the various classes of workers and their organisations. As instances of the numerical growth of tion on veech the various classes of workers and their organizations. As instances of the numerical growth of regarding and a single property of the property

his umon have been largely bettered during the war. The umon had no strike benefits to pay and little legal ane union and no strike seasure to pay and little legal expanse. Both money wags and proportional wage have increased during the war, the latter from "speeding up" and working overtime. Simploi nen't has been steady, every one has had work, and many households, formerly supported by one worket, have had then en units personnel.

down to the children, beco me wage earners. On the down to the children, become wage searcers. On to tother hand, there has been little opportunity for organs of spending. Food has been buyable only was occuped of spending. Food has been buyable only was a composed by the been rapidly held within bounds and could be had only at certain much arreumserfibed times Luntures were frowned upon, partly from patrodiem, partly because there were few luxury factorss at swopen partly because there were few luxury factorss at swopen awang, so that perhaps never before have the poorties who stayed at home and worked been in a better condition financially to engage in any renewal of the class war of labor against capital

war of labor against capital. If this seems a somewhat gloomy picture the canvas is not without its brighter colors. Of course, perhaps none deserves greater attention or will have a more far reaching effect in the solution of the problem, than the educative effect of the war and war labors both upon those who have fought and upon those who have labored at home

Labor has learned of its government from the inside Landor fine learness of the government from the instact Government is no longer a strange extraneous force which must be combatted. The agin th' govern-ment attitude of many laborers who never saw an Irushman, is no longer a commonplace. Administration of rationing systems, which affected high and low alike, the allowance for the disabled soldiers, health provisions for munitions workers, the strict limitations of profiteering capital—all these have done their parts in the education of the average worker to consider his government as something which belongs to him, not semething ment as sometaing which delengs to him, not semething which is a thing apart. And it must not be forgotten that if labor gave up strikes and accepted compilisory arbitration during the war, it received at the same time a measure of recognition from both government and individual industry for which, in many cases, it has striven individual industry for which, in many cases, it has striven vainly for many years

It is endeavored here merely to outline the main avored here merely to outline the main elements of the problem, to show only the question in its broadest and most eatholic aspect. The expert labor statistician may well quarrel with any discussion of the problem which leaves out of consideration those factors, such as the relation of the skilled to the unakilled, the growing feeling of labors, nowfelions and strength disc of labor s confidence and strength due to the heavily restrictive measures which have kept capital from its favorite course of charging all the traffic would stand, and the political aspects of the subject. But it seems as if the question at issue is too clear-cut either to need elucidation by such added discussion or to be benefitted

by the inclusion of a wealth of details.

In the largest sense, the labor question is one of available work to be done and available hands to do it, of

In the largest sense, the labor question afform of available works of the property of the prop

# How Will the Gasoline Engine Develop?

Some of the Things That Intelligent Imagination Sees in the Future

By Howard Warren

WHEN the war broke out the gasoline engine was making steady, if not particularly rapid, progress For several years attention had been directed to the For several years attention had been directed to the improvement of details and the solution of minor problems, the general design remaining unchanged. The period of rapid progress that followed the realiza-tion, a quarter-century ago, of the possibilities of internal combination, help passed, as an accepted power unit, the gasoline engines had sequired, with its acceptance, more or less of an accepted form it avolution toward what-evers it is ultimately to be was taking its normal, deliberate course—one which ordinarily is satisfactory enough

ever it is ultimately to be was taking its normal, delication course—one which ordinarily is satisfactory enough. The war, however, brought new conditions and new demands. It brought the demand that the gasoline engine be made a much better machine without waiting for the lapse of sufficient time for the ordinary evolufor the lapse of sufficient time for the ordinary evolu-tionary reactions. The immediate effect was quicken-ing of effort, with the determination to bring the future back to the present—to do today things that under less streamons conditions would have been left for next year, or even for five or ten years heard pass are sufficiently present of warrains necessity has resulted in the socomplakment of much, and has started hims of sifert

accompliamment of much, and has started lines of affort that are more or less certain to lead to remarkable endings Just what has been done, just what has been started and not yet finished, we shall not know until silence has become an altogether unnecessary precau-tion. But if fragmentary hint are not entirely mislead-ing, there will be ravelations that will open many an eye Some of the results are known, others are not, a great

deal is left to the imagination Leaving a matter of this sort to the imagination is nothing more or less than an invitation to speculate against the future What latent possibilities are there in the internal combustion engine? What undesirable qualities does it possess that may perhaps be eliminated?
Today the most conservative of engineers heataces
before using the word 'impossible,' even though possibility may be utterly obscure. In the past many have used this word who were emment men, as well qualified to express opinions as the contemporaneous tate of the engineering profession Where they erred was in making all their calculations in the light of what they already knew failing to take into consideration the unknown quantity of future knowledge which might-which did-cutilely upset prognostica-

There is, then, ample justification for speculating a inter is, then, ample pushibities of the internal com-bustion engine, without garing too intendy into the undeanably bright light of existing knowledge and being blinded by it. The fact that something is utterly im possible today means only one thing—that we do not yet know how to accomplish it—it by no means indicates that we shall never know how to accomplish it

So let us speculate a little
The thought that turns up automatically is that of
the internal combustion furbine. But while that type
of motor will doubtless come into being, without reon motor will conceive come into being, without re-ciprocating auxiliaries or attuidant drawbacks of other sorts, there is pleaty of room for the imagination to play in, without going beyond the familiar reciprocating engine of today In fact, it is necessary merely to take

ought of some of the commonplaces of engineering for instance when we feed to a gasoline engine 100 eat units in the shape of fuct all we get back in the form of power as the equivalent of about twenty five Using easy, round numbers if appears that something like 10 per cent of the fuel burned is used to generate the power to oversome the friction of the oving parts, that 30 per cent is literally and intentionmoving parts, that on per term a natural and movement ally thrown to the winds—abstract I from the cylinder walls by the water jacket, carried to the radiator, and dissipated in the rush of cooling mr that 35 per cent goes straight out through the exhaust pipe bo it is goes straight out through the exhaust pipe So it is necessary to buy and carry around and handle and pro-

vide space for three gallons of fuel for every gallon that does useful work Right there is a vast field of possi-bilities—a field 300 per cent greater than that of actual-

gasoine engine were as producial of heat as is the gasoine engine, it would be a hopelessly inefficient piece of apparatus. Once steam reaches the evhinders, however, it is handled with the most purely however. If the steam engine were as produgal of heat as is the so that not a heat unit shall be lost that it is possible What heat is left after the first piston has been moved in transferred to another cylinder and set to work on another piston, even unto the third and fourth ex-pansion. When the steam is too old and feels to push pistons it is suddenly condensed and made to do work on the other side of the pistons by leaving a vacuum Finally the heat still left in the water is saved by going back into the builer with the feed water

Compare this with the beautifully simple process of the gasoline ingine. At the end of the stroke a valve opens and 35 per cent of the power that has been created is shot into the air through the exhaust pipe, while 30 per cent is blown away by another route—neither exit being big enough to pass all the heat that must be wasted

These things are done because we do not know any way to avoid them Thinination of the cooling system would allow most of the heat carried off by the cooling water to remain in the cylinders but with existing engines the result would be merely a small increase of power for a few revolutions, followed by stoppage power for a new revolutions, followed by stoppage through overheating. Increasing the temperature of the cylinder walls beyond a certain point first distroys the lubricating qualities of the oil and without oil we do not at present know how to make an engine run Even if we had an cul that would stand all the heat we could generate, however, we could not advance much further, for we should have excessive expansion to contend with. while the metals we use for cylinders and pistons would

(Continued on page \$02)

# Correspondence

The editors are not responsible for statements made in the correspondence column Anonymous commu nications cannot be considered but the names of cor respondents will be withheld when so desired

# "Second Sight" or Looking Glass?

To the Editor of the Scientific Australia
In a small book ontitled "Psychical Research," one
of the series insued as the "Home University Library of
Modern Knowledge, occurs this paragraph, describing
the result of an experiment with reference to mental transference

transference
"Object a pair of sensors partly open, points downward Percipient says, 'It is a pair of sensors standing up, a little open.' Object a key Percipient 'It is bright, it looks like a key.' Told to draw it, the percipient drew it inverted Object outline drawing of a little flag Percipient 'It is a flag.' I old to draw it, bright, it looks like a key. Told to draw it, the per-cipient drew it inverted Object outline drawing of a little flag. Percipient 'It as a flag. Told to draw it, she draw it as it was, upright, but laterally inverted. The frequent lateral unversion of objects by other per-cipients I have also noticed A different drawing was next made, but put saide and purposely the drawing of the flag again put up. Percupient 'I stall see the flag. Object an oval locket, hung up. Percipient 'I see comething poid, comething hazing, like a gold locket Acted what shape, 'It is oval'.
Now in were of the fact that some of the minute

Now in view of the fact that some of the minute reflectors used by eard manipulators and conjurers give an inverted or reversed image, should not all cases where the "percipient," using that name at its face value, draws the object reversed in any direction, be ruled out as frauds A R WARD.

Sydney, N S. W.

# The Science of Raglish Spelling

To the Editor of the SCIENTIFIC AMERICAN In a letter in the SCIENTIFIC AMERICAN of Dec 21st in a sector in the occurrence American of a Universal alphabet. To make one would be a big program A much angalier program would be the sensitific representa-tion on paper of the sounds used in standard English speech. Usage has in the course of centuries done most part of the work. Bue had only 20 letters of the alphabet

to work with and she had far more sounds to represent to work with and she had far more sounds to represent, so she invented digraphs and trigraphs and tetragraphs, and with them she had far and away more means of representing sounds than she had sounds to represent a represent the representation of the representatio Perhaps you may lead us wrong and make things

worse than ever people seem to sty.

No doubt some digraphs that Usage has introduced are as well established as the most fundamental letters of the alphabet We have for example the digraph ch which might be called chay, and the digraph ag, which might be called ing, and the digraph as which might be called sh, and the digraph th which has to represent two sounds and might have two names ith and these

two sounds and might have two names the and thee All these digraphs are perf and parcel of our system of representing on paper the sunds of our speech. The letters a, e, i, o and it lying has appropriated to the representation of the sounds cilled short a, short o, short is short o and short u as in the words pat, pet, pit, pot and but

pot and but

Then Usage had the sounds I ng a, long c, long t,
long c and long u to provide for and she sometimes
represented them by the letters a c 1 c and u, gs was
only natural as the letters have the names of the seume
Usage also tried those letters f slowed by a consona t Usage also tried those letters i month of the mito, mote and then by an e as in the words mate mete, mito, mote war entisfactory. Usage and mute But that was not very satisfactory Usa graphs. And there is a merino distance are obtained graphs and there is a require lattic raging whether the digraph is should represent the sound heard in the English mans of the letter e. And there is another furrous bath for the honor of representing the sound heard in the I ngish aams of the letter

senting the sound neard in the 1 nglish name of the letter I And there are minor sugagements, too I have written a pamphit alout the matter called "The Science of English Spriling and I would send a copy of it post free to any of your readers who would do e the honor to write for it

WM CUTHEREST HOLMES.

# Bamboo Pipe Organs

To the Editor of the SCIENTIFIC AMERICAN In the article on page 328 of your usage of Orober 19th last, you say the stated that there is one other bamboo organ in the orient but it is not possible at this time to secure definite information relative to its whereabouts

It may interest you to know that there is a bamboo organ in the parish church at Las Pinas, a minicipality on the bay eight miles south of Manila. It was begun in 1818 under the rectorate of Father Diego and finished in about 1823, damaged by the famous earthquake of 1863, partially repaired, but then neglected until rently It is now playing
It contains 832 bamboo pipes and 121 metal pipes

(bugiers) outside the organ
It contains 23 stops, 12 on the right and 11 on the left

1-Light trumpet 2- Accompaniment trumpet 2—Bugler 3-Major flute 4-Viohn flute 3-Major flute 4-Major violin

5-1st octavo 6-2d octavo 6- 2d ortavo 7-Docena primera y segunda 7-1st docena 8 -Quincena primera y segunda 8-2d docena 9- Grman flute 9-1st quincena

10—German flute (buglery) 11—Piccolo flute 10—2d quincena 11— Nightingale The keyboard, contains five octavos

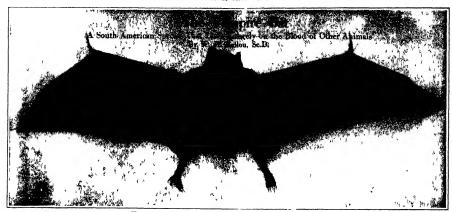
The 19 tone major notes first to the left have similar sounds and the 17 chords to the right have different tones, the tones begin from the seven last major notes

to the left I here are 12 pedals The drum and nightingale sound like those of other organs, but by pouring a little water in the deposit it produces the song of birds and for that reason the

organist on Christmas I ve has always a bottle of water by his side to use when he wants the enchanted birds to sing.
The bamboos have never been painted or variabled according to the oldest man of the locality, but when they are wiped with a wet rag they appear to have been

The original pipes still remain in a state of remarkable preservation but it has been found that the new ones were subject to dony and the attacks of inaccts

THOMAS CARY WELLH



The only photograph of the vampire bat to be found in the United States

I HUT 110 MIIIIR U.S.A. engaged for six A years in making a zoological Survey of South America for the American Museum of Natural History New York has turned in to that institution more than 100 specimens of the vampure but together with other and large collections of new birds mammals and reptiles arge collections of the birds manimals and reprices. These bats will now undergo an intensive study by men of varied branches of since in order to add to our incitedore slender knowledge of the only true vanipure known. The late (c) and Roosevil declared the exist known The late (clinic Roosevelt in delared the exist time of this necturous increase to all animal life on his return from his Brasilian capedition. It raintained for Fourtmant Miller however to risk his life to capture a large (oldection of the indinght assuming for study and exhibition

Luntenant Miller has further distinguished himself

Hamienhali Milite has intriner distinguismen numbers by writing a book on his velorations entitled. In the Wilds of South America from which much of the following state uncateoner imige to supprise a best reached. The trust from C ochabumba gots up stacisly until an elevation of 12 080 feet is reached. Beyond the high summer of the first ridge, lies the high mountain valley.

in which is located the Quechina village of Cuchinnelia, including pig pen—the trail leads castward to an elevation of 13 400 feet—We had traveled to the Surgas on mules owned by the expedition and upon our arrival turned them loose to feed as usual

Next morning the animals were in a sorry plight They had been visited by vampue buts during the night and bled as badly that we had to send them back to I rotal without delay. Severe as this attack scened to be it was mild compared to what we were to see later on

We discovered clumps of small bats gulity of the execu tion spending the days under the rist of our but and despatched many of them but only hit and despatched many of them on this made no impression whatever upon their vast numbers. Humans also are bitten on any pirt of the body which is left exposed at might and I have fre-quently seen Indians who had been a

quently seen Indones who had been thecked on nose forched and arms. The forest of Iodos Sintos was foll of supprises. At night vampure butscame out in bordes they attacked every those from human beings down. Iven the few mescrable pigs lept by the Indians were secretly liften and kept up a con-tinuous spiraling as the I hood thirsty rectures settled on their usually at the retires settled on them usually at the best file ers and began their pumful oper toms. He wast sufferers by fire however wer an mules. As soon as the sme set an ice is brought the snimals to the curd and strapped anyas covers over them a pec aution of little avail for the bats attacked the expect parts causing the mules to kick and roll with the result that then e vers were som tern off

We went out frequently to wat h these oxious credures at work. After or obnoxious credures at work cling above their prospective victor several times they dropped suddenly usually upon the neck or flanks and at once began to bite and suck making a grating sound with teeth all the while. They paid no but clung with fedded wings to their jrey perfectly motionless and in an upright jostion. If we moved



The upper incisor which serves the vampire bat in puncturing the hide of its victims

they uttered a few squeaks but made no attempt to fly until we reached for them not came to within a few inches when they reluctantly flutered up but almost immediately settled on the other side of the animal

In the morning the mules were in a pathotic condition, blood continued to flow from the wounds made by the



Colonel Roosevelt's mule, which was almost destroyed by the vampire bats in Paraguny

bats sharp teeth so that the ground was red and the unimals were covered with blood from head to foot It was always necessary to take them to the river and wash than then disinfect the numerous punctures II this is not done flux attack the sore spots, infesting them with their larvax and the animals die of blood poison. After three nights we were compelled to take the mules back to (ochabamba, as they were on the verge of exhaustion

Of all the world's creatures met by Colonel Roosevelt in his explorations for the Smithsonian Institution and in his explorations for the Simithsonian Institution and the American Museum he found the vampire but the super-monster of iniquity compared with which, Armageddon and mislefactors of great wealth were as nothing. In his work. I brough the Brasilian Wilder-

Results, and the land of the bloodsucking bats. We were now in the land of the bloodsucking bats. (Vepotuba River Paraguay.) Those are the vampure bats that suck the blood of living creatures, clinging to or lovering against the shoulder of a hors or cow, or the head or foot of a skeping man and making a wound hand or foot of a skeping man and making a wound from which the blood continues to flow long after the but a thrist has been stated. At lapirapoon there were mithe cattle. One of the calves turned up one morn-ing weak from the lows of blood which was still trackling from the wound forward of the shoulder made by the bat In places not only muke and cattle but chukens have to be housed behind batproof protection at night

nave to be housed lichted battproof protection at might. In offender as rol various species. One of the Brarlian members of our party Hochait, the botance was a colloged able. Ho informed me that he had known even the bug fruit-esting base to take to blood asking. I how off not, as corting to has observations asking. I how off not, as corting to home of the same of the original would be the same of the sa

the true vampires they would lap the flowing blood and enlarge the wound South America inskes up for its lack, relatively to Africa and India, of large man-eating carnivores by the extraordinary ferocity or bloodthirstiness of vampire bats of which the kinfolks elsewhere are harmhas it is only here that fish no bigger than a trout kill swimmers, and bats the size of the ordinary 'flittermice' of the northern hemisphere, drain the life blood

of big beasts and man himself.

The vampire bat exclusive to South America, is known to science as Desmodus rulus. To meet all the requirements of a true vampire, it is perhaps the most highly specialized animal in existence, not excepting man himself. As a good guess, the vampire bat may be said to belong to the exclusive faunae of South America, arising successively from ancestors, the remains of which have neither been found remains of which mave heather took toward in fossil form nor in existing forms yet discovered. Their relationship to other bats of the world, of which there are at least 2,000 species, hangs on several minor

characters These or similar structural characters are found in the family of bias known as the Phyllostowides, a North American tribe of fruit asters having small leaf noses Miller says "They are like the Phyllostomidae in respect to wing, pestoral girdle, and pelvis, except that arm) are more nearly equal in saic The fluids (lower leg bone) is large, extending to the head of the thing faith bone). All of the long bones of the leg and wing are deeply groved for accommodation of the muscles. The teeth are highly specialised for cutting, all trace of the crusting surface reduced that the length of the entire upper row is less than that of the cannot teeth. The stomach is a slender structure. The nostrils are surrounded by dermal outgrowth that form a very rudamentary nose leaf".

I examined the South American specimens in the American Musuum, both skeletons and skins. The blood surking characteristic comprised two large, projecting upper incisor teeth, which worked perfectly with two lesser lower incisors perfectly with two lesser lower incisors of the state of the state of the state of the state of the lesser in the state of the

tension, furnished at its extremity with a number of papillae (nipples), forming an organ of suction

papillas (apples), forming an organ of sutton. Most penular, jouwers is the fact that in it process. Most penular, jouwers is the fact that in the process of an order to become a true vampire, the creature has consolidated all of its intestines into one tube or alimentary canal. It has no other intestinal organ whist ever, and in consequence nothing but a liquid can pass through it. Just what must we conclude from that? Some of the lowest forms of animal life having only an intestinal tube, digest food as fast as it enters than intestinal tube, digest food as fast as it enters than gorgue, itself with the blood of another animal having nor searour in which to store it is suncheave but it simultaneously and rapidly assumilate the essential constituents enterly through its own wasten Or on the other hand its intestiniorm tube may be food to the control of the sunch that the vamping which is the considerable amount of pilfered blood retiring to its retreat to hang up by ta feet during davlight digasting at lesure. There is also the possibility of consolidation in the term to the term of the considerable amount of pilfered blood retiring to its retreat to hang up by ta feet during davlight digasting at lesure. There is also the possibility of consolidation in the term of the considerable amount of pilfered blood retiring not as the retreatment of the form that is maintained for the more of the transition of the term of the ter

The bat is unquestionably not only the oldest but the first mamma! It seems to have arrived river from some unknown type of reptile that aspired to safe avaitour rather than crawling walking or running While it bears much resemblance to some of the prehistoric flying reptiles, the structure of its brain case shows little or no affinitive in that direction An everall parallel is a Confession of the December of the Confession of the Confession of the December of the Confession 


The submarine "dart"—the forerunner of the depth bomb. Charge 25 pounds of TNT Fired from a one-pounder gun

Submarine Dart-Progenitor of the Depth Bomb

TIII depth bomb, which by the close of the war had grown to the great weight of 600 pounds began in a very modest way. Someone in the British ray conceived the idea of thems in, if if explorer shell what would read the authorities in the sate of the sate of the sate of the sate of a shell containing about 25 pcm is 11 M the shell being mounted on a shalf. In a shift is read the double purpose of filling the bore fit and from which the double purpose of filling the bore fit and from which the double purpose of filling the bore fit and from which the double purpose of filling the bore fit and from which the double purpose of filling the bore fit and from which the double purpose of filling the bore fit and from which is the first of the double purpose of filling the bore fit and the world which we read in from the first the first of the first of the first contained which we first the first 
# U. S. Navy 7-inch Caterpillar Mount By H Delano, Commander U S N

FillOM the moment the United States the Circle of the war it was a fore, one on close on that the Hum was in for action—switt decisions action. American arrival of action—switt decisions action—line that the safet defines is a strong off is a and they took defines to strong off its and they took to the constraints the theory. Logic tropps had to 1.1 transport d. Depth charges turned 1 the tik. Len were s. t. on their critical of the transport d. Depth charges turned 1 the tik. Len were s. t. on their critical of the transport d. Depth charges turned 1 the tik. Len were s. t. on the critical constitution of the transport d. Depth critical langhed at their processing and the language of the depth of the constitution of the decision of the dec

On short the Hun was treat 11 on wher surprise action which first dissouncited, then dismayed him 1 uraged be altered about the chief of the surprise of the control of the treated but was met in the open and republed. He set up a terribe I omburdment, but every shell was returned to ridd. It made him nervous and jumps for the jame was a new one. In every date with short and medium tange guns the American Array was vectorious. Here was animum tion a pleaty for guns of every caliber 1 ut unfortunately in the early steps of our unfortunately in the early steps of in.

participation high powered artillery was scarce. With out fairly long range guns the enemy could not be prevented from massing in rear of his lines.

wated from massing in rear of his hins.

It happened that the Newy possissed some highpower is vern inch rifles and it was thought they would
be effective if mounted on light in aniwar trueks. Marmis
were eager to man them. Pershing was withing so
designe were hirredly compited and arrangement were
being made for manufacture when a major of mannes
seaged to command the artillers beginned to the sassing of the command the artillers beginned to the formany terms of the major than of the plane be navely
remarked. When the marmis hir is though we don't
want to wait while track is I oug had we want to follow
want to wait while track is I oug had we want to follow
right up with the drillers. Can it you give us something
(bet). We could—we had to after such a queet display
of contidence.

A swin inch gun enpable of launching a projectile at 2 800 Reet per section die in encessarily have. This out triple 28 700 pounds. To mount it on wheels sufficiently large to carry the deadwright plus the live look thrown upon them at the meant of discharge was an easy matter I ut to buil I a mount on wheels so that the major anglet I follow right up without an instant is driley was out of the questin—the hitels would be exturbed too large. A caterpillar mount was the solu

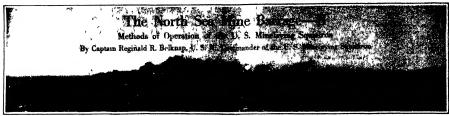
But little investigation was necessary to learn that there wer no enterpillars on the mark t sufficiently strong and sugged for the task. They had

strong and rugged for the test. They had to be designed. Within 40 days the New 4 Gun Fretory for the decider and the first adoptation of the caterpillar to the mounting of heavy, high powered.

to the mounting of heavy high powered rillis was perfected. In older to ensure mobility, the prime requisite was a mount which required as dissemilling prin to being transported to a new firing position. To be truly \*\*Connect Int. 9 | 14



The seven-lack gan on exterpillar mount. Left, at 40-degrees elevation; shove, read; to advance with the infantry; right, the trunnion bearings, the plates trail and axio



Destroyers making a smoke-screen to protect the fleet during mine-laying operation

Till whole Yanker Minirg Spr b n is it came to be I nown deserves mention by nair as per the accompanying title which gives the principal characteristics of the individual tips. The quadranton title seagong part of the Mine Force makes their Admiral Joseph Strauss, U.S.A.

the ferct on shore and the reput ship Black Hawk,

Capt R C Bulmer U S N The mine layers arrived May 25th 1918 on time and ready for lusmess notwithstanding their state of their less than two months before

in fact the spindron was never the cause of any delay and never failed in any operation. It was arranged that upon 48 hours a size. Admiral Bentty of the Grand Licet would assue the orders for a mming operation, send a destroyer esbattle cruser squa from and a light cruser squadron as a support against a possil le raid. Though the two minelaxing squad rons often went out at the same time they rons often with out at the similar three they operated in company only twice. They were 13 American operations 11 British and of the libid tetal file American Squadron planted 56 571. In four liftle and the British 13 516.

Larly in him proparations were going full blast for the first nunchying oper On shore the mine parts wer tested ad justed and assembled then the completed mines were sent by rail to the waterade for loading into lighters to be towed off to the ships. After landing on the tracks on board each mine westest d for any derangement in the three bandlings in train it from the base. By fune title weevything was ready for departure at midnight All possil servey had been observed I course information could be sent through to Germany in 18 borns or so time cooligh for them to batch out some kind if interference

Going out on a mining excursion—a word admited for its cheerful suggestion of a return, tired but happy our squadrons two detachments and the distrover escart would unite just outside Cromarty, the minelayers forming in two columns with the destroyers usually 12 m number spread in a sereen shead flagabip and on the flanks. The squadron flagship San Francisco always led one column and was guide for the whole force. The instructions for these excursions

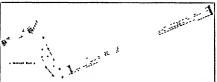
were as comprehensive as foresight could make them while allowing ample dis-VII captains and thees ort leader usually Captain Godfrey R \ in H M \ Vampue

were formished memoranda of the intended courses and distances the numing or ler presented the successive presented the successed formations and any special procedure and a planting schedule a corate to the second presents I when and how many mines cach she was to plant. Once started the planting could outmo as intended even in for or darkness-in both of which conditions we laid mines several times, eight ships in line abreast, 500 yards apart, steaming at 12 knots

Our courses led through waters up to mines had to be our courses ted intogra waters with an and night in the regular throughfure of enemy sul marines. The minefield area had been publicly notified three months in advance to warn neutral shipping—an I the enemy might casely have strewn some mines there in the random chance of getting us One ship blown up or destroyed the other nine also One ship blown up would have desabled he other nine also And as the planting

| MINF SQUADRON ONF U S                            | ATI ANTI   | FLE     | FT      |         |        |          |
|--------------------------------------------------|------------|---------|---------|---------|--------|----------|
| nerty Regular Crusers Twin Strew                 | Mines Ross | Diegi   | Off     | Mes     | Leth   | Dreft    |
| IN FRANCISCO Flagship-Captain H V Butler         |            | 1       |         |         | Ft     | Ft       |
| mn an log and Chief of Staff                     | 1 1 18     | 4 600   | 27      | 400     | 325    | 24       |
| IAI TIMORE Captain A W Marshall                  | 1 18       | 5 500   | 21      | 339     | 337    | 24       |
| z 4 uthern I acide or M rgan Liners Single Strew | _          | _       |         |         |        |          |
| ANANDAIGI A (El SIGI O)-Capt W II Reynolds       | la i en    | rried r | segie   | na d    | decks  | 800      |
| ANONICUS (11 C1D)-Captain 1 L Johnson            | rulk t     | 00 mai  | imum    | 6 mir   | e elev | ature    |
| IOUSATONIC (F1 RIO)—Captain J W Greenela k       | 1 kt for 6 | 000 to  | au lei  | agth 40 | uð ít  | draft    |
| OANOK! (F1 DIA)—Caplain ( D Stearns              | با⊾ اد     | ff era  | 100 n e | en.     |        |          |
| x-Old Don mon Linera Hingle Berew                | 1 a 1 61   | 0 mini  | e on    | 2 dec   | k  4   | mine     |
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| ARANAC (HAMILTON) Captain S Gannon               | 1 ft le    |         |         |         |        |          |
| z Faster: Steamship Company Liners Twin Screw    | 1 1 30     | 1 mine  | 40      | knota   | 4 MKI  | tone     |
| ROOSTOOK (BI NKTR HIII) Capt J M Tout            | 1 gtt 387  |         |         |         |        |          |
| UAW MUT (MASSACHUSF FTS) Cantain W 1             |            |         |         |         |        |          |
| ( I veri m                                       |            |         |         |         |        |          |
| as to tials 700 nines 33 200 t no 206 Since      | . 15       | . 40    | 73 In   | ell .   | - 1    | ruistr . |

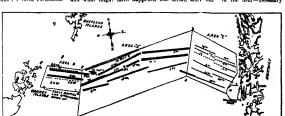
speel 11 kn



Field planted by six ships, abreast, 13 1/2 knots, dropping mines every 111, seconds Wh in one-ship finished her successor would take on it incliantly. At the left end is wheeled to right first planting marker busys by which it prelong the field on a later of At the kitt end squadren

progressed we had to make us of navigation buoys planted in the open sea, obviously for our use. The British had warned us from their own experience of the enemy s habit of moving such bu ye whenever seen, or planting mines near them-sometimes doing both

Besides these exterior risks, there was constant danger from fire. The converted ships were full of woodwork, and what might have happened was shown since our



The heavy black lines represent Solds of mines laid by U S. minelayers

the lighter lines were laid by British missispers. Exemptions 1 and 12 part 2 are of 3 lines. Exemption 2 is of 2 lines. Four to 7 have 5 lines 8 and 9 have 6 lines 10 11 12 part 1 have 5 lines 13 begins with 6 lines then 2 lines. All Hillsin fields are of 2 lines even those adjacent to 1 with and with where they are in a single line.

return home, by the rapid spread of a fire in one ship, the night after she had cleared herself of mines. The sleeping officers had to escape in their night clothes, and the men in the engine room were barely able to attend the pumps without sufficiation

There was the further chance of a surface raid destroyer escort was prepared to engage its own kind, as well as submarines and even to make a sacrifice attack

on light crusers, to assist our escape, but our moderate speed—15 knots at best when keeping together—and the small number and caliber of our guns, made us number and cantor of our guns, made us rather helpiless against an enemy cruser's long range six inch gunfire and 28 knots speed Moreover, when the enemy began to feel the barrier's restriction on his submarines operations, it was expected that he would attempt to sweep through and destroy us who were blocking his way The heavy ships in support were intended to prevent that, or else to bring on a fleet engagement. In these ways our sensitive squadron would serve a double purpose. either one of which would help end the war but possibly also ourselves

However all that did not worry Stick to your job and go up with it," was the prevailing spirit. The work was was the prevaining spirit. The work was too interesting, steady and arduous for uneasy thoughts. The 'San Francisco' and Baltimore, old hands at mining, set a high standard and fast pace, which every man was keen for his ship to equal and it was well understood by all hands that only the best efforts of every soul could make the kind of team work-throughout

each ship and by all ships together-needed to produce the success promised in

To maintain a careful habit among the men, without making them jumpy or fearful, the absolute necessity for sustained attention was emphasized the same care being needed with the 800th mine as with the first or the fifty-first And to prevent

over-confidence growing with familiarity, unremuting pains wer, exercised to note and follow up all irregularities and apparent slackness—not to find fault, but keep things taut overwhere and carry each excursion through with better than railroad precision

The start of mine planting was always preceded by a busy half-hour Accurate determination of the position of the field—necessary to know in running the next

excursion close by, and also for sweeping up after the war-depended on steady war—depended on steady speed and steering, with a minimum of changing courses after leaving the nearest fixed mark. There could be o heatation nor trial moves The squadron would approach, take a preliminary formation, turn ships together into a line abreast, stret into a line abress; stretching sometimes a mile and three-quarters. Then after a brief steadying interval, down would go the planting mgsal, and overboard the first mane from each ship.

Since all 10 ships abresst would widen the field unnecessarily, the mining would have been with only sinks about

begin with only eight abreast two m another line 500 yards ahead When places directly

astern of them were vacated, these two would case back into the main line, their predeceasors speeding ahead Amnie time was allowed to do this slowly, before their turn came to plant, so as to avoid any extra demand on the engines, which might follow, if a ship dropped back too fast. The steadiest too fast. The steadiest the rule throughout the mine planting, to minimise possible causes of casualty The decrepit, but we took no pesary chances of spoiling a good performance by the squadron as a whole

When all mines were out of one ship, her line was prolonged by a parallel begun at the same instant by her prescribed successor Mines were dropped every feet, in lines 53) yards apart, the nearest distance the minelayers could safely steam abreast The schedule arranged to narrow the minefield towards the finish both for compactness and for a greater

both for compactness and for a grossor margin of safety in running the next ex-cursion parallel and close to, when there might be a beam wind or unusual current, tting towards the former field **Faken** altogether, minelaying is not too simple an

altogether, munclaving m not too simple an art
art ni finished planting, the squadron had made a trace like a music score 50 or so miles long A mile boyond the end several mark buoys were dropped, for use to "butt" instead of 'lap the next excursion, then back to the base The men would clean up the decks, secure the mining gear, get a wesh for themselves, and onjoy a macke below—forbidden while mane were on bard, and those who could. would sleep Moving the 400 to 500-ton masses of mines, in slow but steady time,

was ever distinct in the bound of above the was very fastiguing, even with the totally time, was very fastiguing, even with the totally time common to all ships.

Theoretically, the mines in adjacent lines should be staggered, so as to laive and block each other sintervals, but in an open see minefield of immense area, 25 miles wide, with no guide marks whatever, no such muckly is possible or necessary. The great Northern blines Barrage opposed from six to been lines of mines to submore the subman of the subman six of the subman A submarine had more chances of missing than of hitting a mine in one line, but not so for all lines—and one touch was enough

Before the first system of the barries



U.S mining ships in line shreast; in the offing the British ships in column

to come in This was in carly July and before October 10 submarines had been destroy I in the barrier and probably many more. From the very circumstances in that vicinity, the actual till may never be known latest roport is that the G runns almit 23 lost there and other authorities ascril the the surrender and

half way across, reports of damage to the caemy began

A New Surgical Method

A VERY important progress in surgery is announced in France, which consists in the discovery of a method of performing anysurgic dioperation without pain. On this new method, the principle is to make the patient. insensible to pain but he does not lose consciousness. It is based on a principle which was brought out several

marine campaign which the Northern Mine Barrage

And with due allowance for the poets because per-

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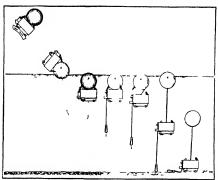
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years ago, and this allowed of making oper ations on the lower limbs and the lower part of the body without pain by injections of cocnine or similar substance into the spinal column But this treatment did not due msensibility in the upper part of the Within a recent period Dr Le I illatre succeeded in making the entire body insensible by the use of a single injection and the liquid comes in contact with the spinal column throughout its whole extent column throughout its whole extent. He makes use of an injection needle and a glass syringe. After purjation the day before and also half an hour before the operation he makes the injection of the liquid which is cocame or other substances such as sulfate of strychnine and sparteme. The patient has his eyes bound so as not to be affected by external movement and he sats on a table with his leas stretched out before him. The application is made at the lower end of the spinal column and upon making a puncture the liquid surrounding the spinal column flows out. When a sufficient amount has flowed depending on the degree of insensibility which it is desir to produce, he applies the syringe with the cocaine or other solution and pushes in the contents. This action is repeated several times and the operator obtains a properly regulated mixture of cocuine and the spinal fluid. The insensibility of the lower part of the hody is almost instan-taneous, in the trunk and in the arms and head it follows a few moments after the patient is in a condition to undergo almost any kind of surgical operation and without pain but he remains conscious



How the mine is anchored

When rathe and surviver such the water pourous or control recipions stip looks, which holds makes and author together and tiltered pourous the processing of the CTP, plummer being and market pourous and the same length that it is if derived it look in mine beneath the survive cord is made the same length that it is if derived it look in mine beneath the survive TPs plummer being sold metal andse faster than the laid vanious that keepingt this cord tast, but when the plummer strikes bottom the cord shackers refeasing the past which bottom the real T be sucher or suitable; to shall draw the limit of work until the anchors before the real T be sucher or suitable; to shall draw the limit of work until the anchors.



Melating the mines from the barge to the

A mine going everboard from the stern of a minelayer

Train of mines being hauled along by winch, Overhead, a marker buoy

# New York's Aeronautical Exposition

# Observations at the Exposition and Some of the Conclusions Which May Be Drawn with Regard to Military and Commercial Aviation

Till surplane of war and the surplane of peace stand "Mill airpian of wai tod the airpians of peace status involved at these 1 is several years had an air all developed and air airpian with a result of the airpian had been more or has a maried serret. For an ecounts have, cam back to evidinase regarding the 1 lative characterists and the evidinase regarding the 1 lative characterists and one photographs have be n primitted to reach the pieces of the properties of the properties. It is not that with the properties of the will with the properties of the will with the properties of the will with the properties of the status of the properties of the will with the properties of the properties of the will be propertied to the properties of the propert

antiquited machines inti-quited in the military sense which means a type that has been in use if the first for some mently and that has fallen into the hards of nas than in the arms of the enemy with its w dith of an vations and sorts and the article of the integral and the art interesting of phit graphs have then told but a small part of the entire but a small part of the entire stiry In after all is said and done there is nothing like viewing the bestibed hke viewing the he articles at 1 st hand

To chind it an American Dellavilland buttleplane to ain the twn machini guite aboard a hombing plane to to, with the so-called camera gui used in training serial markemen to study a at close range to peer into the cockpit of a British B E-5 Scout to stand B L-5 Shout to stand beneath the wings of the gunt Handly Page to see at a glance the leading airplanes of the w '!—all these things and many more were the privilege of the visitor to the New York Aeronautical March 1st to 15th in the Madison Square Carden and the 69th Regiment Armory The visitor had an oppor tunity of seeing for himself what others had seen and photographed and described for him during the past few years And he had the op-portunity of seeing what had never been described par-ticularly in the way of planes for civilian use

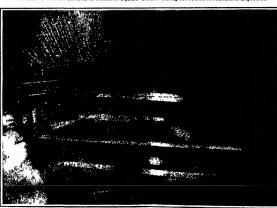
In the matter of military planes it appears from the massed exhibits that the designs have become more or less standardized as the sult of years of competitive effort although during the Alked and particularly the American designers were beginning to question the effi-ciency of accept d construc-tions and were delving into strange fields Most of the tions and were delving into strange fields. Most of the scout machines single scators intended for combat work—either fellowed the general lines of the I reach Spad or the fish shaped planes of the Germans When it came to engines machine-gun equipment, fittings and other details, however there

seems to have been a wide divergence of ideas But all scout plane designers agreed on the cutting down of "parantee," which means unnecessary guy wires, landing gear parts, engine housings and other surfaces offering considerabe head resistance and religiously offering considerable head resistance and religiously applied the stream-lanng which I douard Nicuport first introduced in the monoplane bearing his name. In two-scater battleplanes and general utility planes, the divergence in designs is pronounced. Yet the

general design and equipment of a viteran DeHavilland-lour American plane, which was calcited to thousands of curous visitors may be taken as a good example of that class of lighting machine. With two synchronized mounting the forward and twin ma him gives on a seast mounting account of likel in the ris-vay days of the war. As for large planes, the leading Wit of and timenen types acre well represented. An Witness-built Hand-



General view of the exhibits in Madison Square Garden during the recent Aeronautical Exposition



General view of the well-arranged exhibits in the 69th Regiment Armory

ley-Page and a Caproni triplane and the all-American Glean Martin bomber, were on hand In fact, like nothing else these planes, which by the way are by no means the largest in the world "street to convince the layman of the immediate commercial possibilities of the airplane

Ferhaps the most interesting exhibit of the entire Exposition from a connoisseur's point of view, was the Loening monoplane, developed by an American engineer

during the cloung days of the war and a little too late to serve at the front. The Loening monoplane is output with a Hupano-Eusse engine of 300-horse-sever rating. Its monoplane wings are approved by four nursely spars running at a slant from the underneath side of the wings to the fuselage. Two seats are provided, on for the observer. Complete, and loaded the monoplane weighs 2,600 pounds it has a speed of 145 miles an hour and a "ceiling" of 25 000 feet, carrying sufficient.

fuel for three hours De-spite its rather unorthodox design, this very remarkable machine has established enmachine has established en-viable records among mili-tary planes, and had it not been for the signing of the armistice, the Loening monoplane would have established still more startling records

If anything the Christmas Bullet of hiplane design is still farther removed from accepted practice. This from accepted practice. This machine equipped with a Hall-cent 210 horse-power engine is a single-seater, weight 2,100 pounds with its load and has flexible wings. Its upper plane is 28 feet wide, while the lower one is about one-half of that There is a complete absence of struts between planes, there being a combination wood and steel cantilever structure running throughout the planes to give the necessary support By casting aside all usual means of aside all usual means of bracing the wings, the de-signer has certainly gained tremendous speed with a comparatively small horse-power, but it remains to be seen whether this does be seen whether this does not entail too great a secrifice

of structural strength
The Gallaudet D-4 homber is a seaplane of interesting design because while it has but one engine and a long fuselage member, it employs a propeller instead of tractor a propeller instead of tractor or pulling' ar screw This is accomplished by having the Liberty engine drive the pushing' propeller attached to a ring surrounding the fussings, at the rear of the occupants. In official tests occupants in official tests the Gallaudets essplane has proved quite remarkable with a high speed of 126 miles an hour a slow speed of 426 miles an hour a slowest getaway of 46 miles an hour and a two-mnute climb of 2,100 feet. All of which goes to prove that of Gallaudet design is quite correct

gard to the matter of speed There are several claimants to the title of "the fastest machine in the world" One

machine in the world "One charmers of these is the Christmas "Bullet" which claims a speed of over 180 miles an hour Another is the Thomas Morse MB-3 biplans, equipped with a 300-horse-power lispano-fluss engine, which waghs 2,000 pounds loaded with its angle passenger and claims 165 miles an hour Still another is the Curtiss 18-5 biplans, equipped with the Curtiss engine and weighing 2,800 pounds fully loaded, and for which 183 miles an hour is claimed With the exception of the Curtiss, which Continued mass 190:

# The Wireless Compass

Piloting Ships Into Port by Radio

By Jerome Lachenbruch, Radio Electrician, U. S. N. R. F.

A COIL of wire, a dial registering 380 degrees, a hollow stool shaft, and an automobile steering wheel have overcome the terrors of log and storm to manners approaching port. These few jucces of apparatus comprise the essential parts of the radio compass, an instrument whereby the bearing of any ship on a whore station may be assertaimed with speed and accouracy Through the stimulation of necessity, the radio compasor direction finder, as it is sometimes called, has been in constant operation on naval shore stations during the war Its value has been proved by service, but publica-tion of its efficiency has heretofore been prohibited

With the coming of peace, the attitude of absolute secrecy maintained by the Navy Department in regard to the many inventious perfected by this branch of the military establishment, has relaxed, and the scientific means whereby the men of the navy helped to protect our ports may now be disclosed. The radio compass. which has served us in time of war, is now interpreting

the needs of peace
It is not generally known that wireless operators are It is not generally known that wireless operators are on watch every second of the day at various naval shore stations in the vicinity of New York nor that during the war operators timed the length of as well as the interval between dots and dashes whose characteristics ed suspicion, all the while manipulating the wheel of the radio compass to obtain a direction on the sending station. This exhausting work proved to be of valuable sassistance in locating enemy wireless stations that per-sisted in the surreptitious use of radio despite the governments war order restricting the activities of all but government radio stations

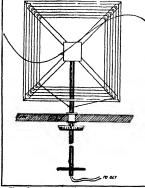
government radio stations.

In construction, the radio compass differs from the usual radio receiving set mainly in the type of antennae used. The familiar aight of several strands of wire stretched at considerable length between high masts is stretched at considerable length between high masts is sheen! In place of the stationary, space-consuming aerial is a rotating five-foot frame with a few turns of stranded opper-brons, wire wound about it. The frame is mounted on a vertical steel shaft which projects downward through the roof of the yado building into the room where the operator is on watch. In many stations, a cupola has been built about the frame with the double purpose of affording protection against the elements and of concealing its presence. At the base of the shaft and within easy reach of the operator, the wheel which controls the turning of the frame is attached The compass dial, usually a curcular aluminum hand with the 360 degroes of the compass clearly engraved on its surface, is fastoned to the shaft near the roof of the radio shack but the indicator is placed in a permanent north and south direction Two leads from the frame form the elec-trical path between the antennae and the receiving set

In conjunction with the receiver, an oscillating audion and an ampli-fier are usually employed thereby magnifying the strength of incoming signals about eight times their normal degree of

audibility
The theory on which The theory on which this unique construction of the radio compass operates involves several characteristics of the electro-magnetic wave it as pure sine wave (which is never met with in practice because of the distorting indistorting influence of objects in and around the radio room), is assumed, three phe-nomena of electricity combine to give the re-eults observed in the radio compass. They radio compass They are the resisting or "bucking" action of in-duced currents, and the differences in amplitude and in phase of an electro-magnetic wave at different intervals of In the accompanying diagram,

plane of the radio compass is shown parallel to the on-coming wave which strikes both sides of the wired frame at different phases and at different amplitudes. Two cleature currents are induced in the antenna the one when the magnetic wave comes in contact with the nearer side of the arial the other when it reaches the farther side These induced currents will be in the same direction and consequently will tend to buck or direction and consequently will tend to buck or counteract each other. But due to the differences in



The radio compass turned parallel to an oncoming

amplitude and in phase of the magnetic wave at the two amplitude and in phase of the magnite wave at the two points of contact, the induced curr at swill be of different attengths and although the one tends to oblitrate the other the difference in strength in twent them is conserved and heard in the telephonis. However, and an incoming electro-magnetic wave strikes the plant of the antenna perpendicularly the currents induced in both sides of the compass will be equal in strength of the same phase and amplitude and will neutralize

each other. No sound is then heard in the telephones. By means of the rotating antennae, the angle at which an electro-magnetic wave acts on it can be controlled by the operator Thus the intensity of an oncoming signal can be increased diminished or completely tuned out by plane of the wheel It is evident then that when the oncoming wave, the sound heard in the phones will represent the maximum strength of the oncoming wave By turning the antennac until this point is found the maximum strength of any signal can be avertained and consequently, the position of the ship or shore station sending it will be disclosed. But to be more accurate, two positions are made known 180 degrees apart. By ulting the diagram the reason for this is appear at will be observed that two waves coming from opposite di rections will affect the radio compass in the same manner

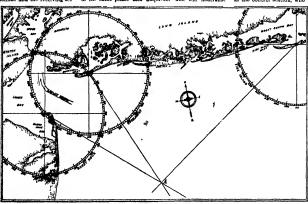
In actual practice however a shore station operator knows that the coast line limits the are of the compass in which he may expect to locate a ship. Moreover to secure the best possible results in the cycry-day operation of the radio compass in guiding vessels into the port of New York, feet radio compass attaining visiting into the part of New York, feet radio compass stations have been estab-lashed at strategic nautical points on the coast near New York. I ach station is connected by a land line telegraph instrument with a central controlling radio station located in the office of the District Communica tion Superintendent, at 44 Whitchall St. This station has been brought to a state of high efficiency by Lieut Commander R B Coffman and Lieut M W Arps

who is in direct charge of the control station.

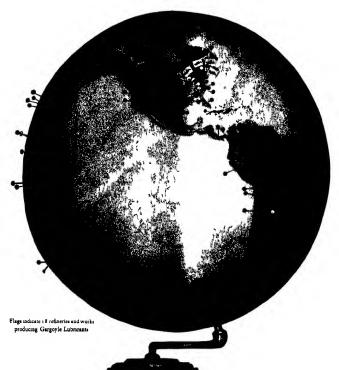
The close connection between the compass stations and the control station simplifies the details of communication with vessels at sea. Within a few minutes a slip may receive definite information as to its position When a ship approaches the 50 or 100-mile coast line, the operator aboard calls New York and asks for his bearing. The ship does not get into direct communicacom with the various company stations as they are equipped only with receiving sets and so cannot reply However, the radio operator at the central controlling station in answering the ship a call transmits a signal to the ship to send its call letters for 30 seconds. At the same time, a telegraph operator at the control station notifies the various compass stations by means of a three-letter signal sent simultaneously to obtain a hearing on the ship sending her call letters. Immediately bearing on the snip senuing ner can letters immediately the various stations in the district, at Montauk Point, L 1, Fire Island, L 1, Rockaway Beach 1 1, Sandy Hook, N J and Mantoloking, N J, turn their compass eels until an accurate bearing is obtained at cach station. This is transmitted to the telegraph operator at the control station, who waits until all stations have

sent their bearings before turning them over to the radio operator The latter when all the compass stations have been heard from, flashes by radio the bearing, in degrees, of the ship on the different shore stations An acknowledgment from the ship of the receipt of the desired mformation completes the opt ration

The accuracy of the bearing reported by each compass station is destation by consulting a map of the coast which is arranged with an inis arranged with an in-genious device for the particular purpose it serves. The map spread out on a large table is covered with glass. Holes are punctured through the glass at the center of the large circles drawn about the various compass stations as cen-ters. The circumferences of the circles are divided into degrees Threads (Continued on page 308)



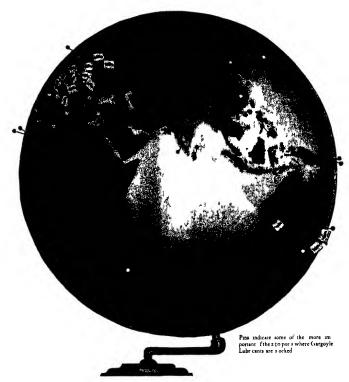
Approaches to New York Harbor showing location of three radio compass stations and how position of a ship sending signals from A may be determined



A new science writes its mark across the faces of two hemispheres. The last 50 years have been called the Mechanical Age. The 50 years ahead will bring the age of Mechanical Efficiency.



In 1913 an international conference of Vacuum Oil Company executives



and engineers from 14 countries finalized the lubrication ideal—the right oil in the right place in the right way.

Lubrication as developed by the Vacuum Oil Company became a science which has opened the way to a new mechanical efficiency for the age ahead.

The work must go on.



# Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

# The Good-Sense School Desk

Willy is a schoolboy round-should read? Why does a schoolship of a flat check and a segunt that indicates ever string. It make best round to sever the flat check and a segunt that make best round to sever the flat check and the sever the flat check and the sever the flat check and the flat check a

The and the industrial state of the state of

The inwester his met the condition outlined by a disk with a top that is boken across must like hock as seen most thereby in the dosk behind the wasted outdern in our second parties. The booken across make the saferoid of completely adjustable alike with regard to distance from the very and made. It is no longer necessars for the student to go through a process of control to the very the proper focus on his work. It sumply adjusts his read at the bottom that prevents the book from shiding off. The rail may be shid to the back of the desk out of the wavy, when it is desard to hus the suiface of the desk for writing thus making the dask adaptable to all require making to



The wrong way to sit-hunched over a flat,



The right way—a comfortable seat before a flexible, tipping desk

# Practising Dentistry on a Model By Ruth Stewart

INSTRUCTION of student dent dentate at the State University of load has been facilitated by means of an operative technicum, the degree by Dr. R H Volland, professor of operative pathology and technology

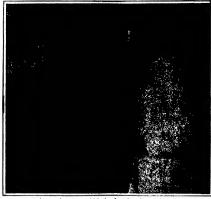
technology
The unit is equipped
with air, gas, and eletricity and is supplied with
a dummy jaw upon which
the normal practice
It is adjustable to all postons which might be taken
by a patient
Necessary instrumints may be placed
upon a shelf attached to the

upon a shelf attached to the implement Methods of making all kinds of repairs and the placing of false teeth are demonstrated by means of this unit

# Removing Old Pavement

THE tearning of an old asphall particularly and especially between car tracks a special machine is in use by the United Railroad of San Francesco which does the work in a very short time, not only tearning it up, but leading it into a work car can one operation. Any work car can be used. On the front of this a 76-pound can be used. On the front of this a 76-pound can one operation. Any work car can be used to the front of this a 76-pound can one operation. Any work car can be used to the front of this a 76-pound work of the front of the short of the short of the form the short an inclined platform extends to guide the sheet of sephalt. When in the loading are. This platform measures 4 feet wide by 15 feet long and has aides to guide the sheet of sephalt. When in the loading are. This platform guide can ahead alowly, the narrow sheet of sephalt between the tracks as reased up the incline and over the edge of the platform into the body of the car is filled, then the car is of the car is filled, then the car is given the continued until that end of the car is filled, then the car is given the continued of the car is filled, then the car is given the continued of the car is filled, then the car is given the continued of the car is filled, then the car is given the continued of the car is filled, then the car is given the continued of the car is filled, then the car is given the continued of the car is filled, then the car is given the continued of the car is filled, then the car is given the car is given to the car is given

This is a labor saver, time saver and money saver



A dummy jaw upon which the dental novice may practice



The apparatus that tears up asphalt pavement and loads it on a flat car in a single operation



A strip of pavement between the tracks being term up and carried away in record time



# Reconstruction Department

A Department Devoted to the Improvement of Old and Development of New Lines of Manufacture

# Suggestions for Manufacturers

QUANTITIES factor have me I fit rin response to the communitary app defrengestics publicle in the action of the majority of these has buffwirled the marketings buggeted but a many mental that is a high delibit in in in its costs inscent to high in a limit so to which put that there they wished to send their sugar transit. There is no may require the discount of the constant for the constant in the costs of the constant in the costs. p it that this eithesis are held in confil no. it must be given to in-vitins. If R instruction I literacts merch is a trivarding agent and will send on communications iddices done
his care. This work is done with int charge either to the manufacturer er to the inventor of it is a voluntary service offer I os no no I to the roustructin of our influstries and topion toprogress

Am mg the suggestions contributed ther are many that do not lift the requirements of any of the man illustrers who have written the I ditor so fr They range from a scheme for t clong music for hot water tog in the from fa infant involute Some maintains that are interesting and apparently practical are illustrated herewith in the hope that they may appeal t some manufacturer who has not yet written to the I ditor They also give some idea of the variety of inventions that have been offered

Countersinking screw head Instead of using a special tool to countersink a seriew hole for a flat head wood seriew an inventor has formed the head with flutes that it will do its own counteranking It will also exert a continuously increasing tightening action as the serew head is driven into the wood

Deglutitory cup -An invention of very different character is one adapted for the sick room. It is an arrangement where by it is possible to swallow inclinies with out exp reneing any disagreeable taste. A small cup is provided which is held in a wire clip that may be attached to the the accompanying illustration. The tunibler is hest partly filled with water and then the cup with the medicine in it is fitted to the tumbler The patient merely drinks the water in the glass and at the same time the medicine flows out and floating on the blm of water is kept from coming into contact with the tongue. Not only liquid medicines but capsules pills and powders can be taken in this way

Hog holder and stock chute Flater has received many inventions pertuning to the farm but as yet as manife tures has edied for suggestions that helping in this class. Here is a device that should appeal to the fermer and stock man. It is a chute for loading h ga mt wag ma for market and also a holder for full grown hogs at ringing The d vice is in the form of crate int which the hog is driven. At one end there is a gife with a wide notch in the bottom which closes down over the neck of the how as shown clearly in lar 2. In this position the gate is locked and the ringing operation may be performed with case Fig 3 shows the crate tilted up on a pair of folding legs so that the stock can be driven into a wagon or truck of standard height A section of the floor 11. I ditor to anxious to help manufacturer

It is ditto a cursion to help manufactures. In he have allowments on this has desiring this reconstruction person it is he are looking for new at the stickly for them is manufactures. It collected from manufactures is stickly at the nature of the depices they by it to first inscending stating at high matter of the depices they by it to first inscending when the matter of the depices they by it to first inscending about 10 vision complex information, about 11 vision in the working at several part of the matter as we are a required to hand the them. The Relation will 1 via the handers to monufact the results of the matter as the services who are to terested. This services we form it without charge.

in the filled up to prevent the animal from buking out. Ing 4 shows how the cluste may be folded up when not in use A novel shoe facing -lic process of threading a shot late through eyelets is tedious to say the least. The ordinary

apt to eatch in the clothing. This is pertecularly true of wamen's wear. To runchy this defect an inventor has pitcuted a new form of boot or shoo lumg the adjacent edges of the shoe

Self countersinking screw-head

For taking disagreeable medicines

are provided with fastening devices

consisting on one side of eyes and, on the other of hooks that are turned in so as

not to cutch the clothing. The shoe lace is secured at the lower and and passes up

through the eyes I o lace the shoe it is merely necessary to slip the hooks over the lace and draw the lace taut Then it

ing is very flexible and adjusts itself readily to the movements of the foot. As may 1 gloves

ho have idle machinery on

the l t does not ordinarily have to be hook 11 v be used for only the upper half of the flup. This same form of lacing used for other articles such as In the latter case it is not necesbe s a liby means of a clip The illustrati | ws how the lace is manipulated



Single-cord boot lacing

# Suggestions for Invention

TIII Reconstruction Editor has reoffered pratuitously to the public, the correspondent not caring to develop has that for the inventors to do Such were the suggestions published in our moue of Junuary under the heading, "A Safe for liberty Bonds Through an over-



Stock shots and bos-holder

omitted We take this opportunity of announting that it was Mr A H Berwal of Wilmington, Delaware, who furnished the suggestions

The following letter has been received from Mr A K Jackson of Toronts, Canada, who suggests some long-needed improvements in the meat packing in-

The requests that have been made through your columns that articles for manufacture in over-equipped plants, be manufacture in over-equipped plants, be submitted, leads me to suggest two very real necessities which would find large sales in the packing houses. Having had 14 years experience in the packing industry, I have been in a position to observe present methods of handing meats and their by-products, and am positive that these articles would meet with favor

' The first is a traveller for beef rails equipped with a clutch instead of the crude block now in use. I have seen hours of valuable time wasted in removing these books from frozen beef, it taking two and sometimes four men to handle one-quarter or side of beef from the rail without accident By the use of a by the man who must carry it, by merely rousing it on his shoulder 3 to 6 inches above its normal position

My second suggestion is an automatic for sectioning sides of hogs This work has always been done by hand This work has always been done by hand except where the band or circular saw is used. The saws are not satisfactory, however, as they draw the bone dust and marrow into the most. With a mechanical cleaver it would be possible to get a straight clean out in exactly the spot where it is required, with one stroke, leaving the operator's hands free to good it. feed it

The cleaver should be made to remain in an upright position when the stroke is finished, in other words the action should be down and then up, instead of up and en down as is the case with automatic

hammers
"It would naturally take a very powerful stroke to seve the ribe in dividing the side from the back of a heavy hog, but by using a weighted cleaver with powerful springs drawn up by a system of gears, and rulessed by a trip arranged m connectous with a foot lever, it should be possible to make one stroke to flams seah out." stroke to frush each out.

# Wanted: a Manufacturer for an Improved Table

THE Editor is in recept of the follow-ing communication and will be glad to forward replies to this letter to the com-pany which is now engaged in manufac-turing these tables

e have read with interest some of the articles in your reconstruction di-vision, and would say we have a patent table serviceshie for either library or

vision, surviseshle for either survey, dining purposes

"This table has been on the market about three years and is selling freely However, we saw at a great dandvantage. Traight rates, and distances are considerable specific trains, and distances are considerable specific trains, and distances are considerable specific trains, and the specific trains are specific trains. The specific trains are specific trains are specific trains and the specific trains are specific trains and the specific trains are specific trains and trains are specific trains.



In strong contrast to the Bettery Don'ts is the one Magneto Don't:

1. Don't Worry

The MAGNETO always does in duty useder the most exacting conditions of speed, climate or load on sirplemes, peacen ger cass, rucks, treators, motorcycles or say other internal combustion enguse. And the only stemation is requires is two drops of oil every two weeks.



Aero
MAGNETO
MAGNETO
MAGNETO

The AERO Magneto was designed and perfected by Splitdorf engineers for the extremely severe service on war airplanes.

It was standard equipment on American arplane engines as well as other arplanes of the U. S. and Allied Governments. And its reliable and efficient performance on these airplane engines and on thousands of heavy transport trucks under actual fighting conditions place it far in the lead of all other ignition systems. The AERO Magneto for passenger cars and trucks offers an ignition system that is without fault.

DIXIE Magnetos and SUMTER Starter Couplings are standard equipment on the insjective of tractors and on many trucks of the leading manufacturers, while SUMTER and DIXIE Magnetos are popular equipment on stationary engines.



 Don't forget to put water in your battery every week

2 Don't use anything but distilled water

3 Don't let the electrolyte spill on top of battery

4 Don't have an open flame in same room with a charging battery or an open battery

5 Don't permit battery to stand without a charge

6 Don't allow sediment to collect in the cells

7 Don't fail to keep the terminals tight

 Don't connect terminals to the wrong poles
 Don't let terminals come in

ontact with battery box

10 Don't forget to test with a hydrometer at least once a

11 Don't let your battery become over charged

12 Don't permit plates to become buckled by lack of water

13 Don't forget to turn off your ignition and light switches when you stop your engine or your battery may run out.





# Recently Patented Inventions

Brief Descriptions of Recently Patented Mechanical and Electrical Desices, Tools, Form Implements, Etc.

Peritalizing to Appened 

(A) TW. Hors. 70' South Hope No. 1 on libraries of a thin narrow plate of need a beautiful 
Angules (a) The libraries or take the case of the pass and crossed in these needs of the care of the case of the cas

El ECTRIC BELL — J F RODORRE REMBER St near Murick Road Jamaks 1 1 N 1 The object of the invention is to provi best electric bell provided with an arrangement for making and breaking the circuit when the call is energized and pressure to receive on the consider cores.

Another object is to provide but few parts not liable to get out of order thus simplifying the construction and reducing the cost of manu.

# Of Interest to Farmers

CORN UNIONFREE O G OMARA BOX 12 R F D F Cambridge III for invention relates particularly to astruitural equitivating implements. An object is to provide an attach ment for cultivators whereby the small cou-plants may be uncovered, the closic destroyed the weeds uprooted and the hill shaped work of plowing or cultivating progressives

APPARATUS FOR HANDING RACKS -APPARATUS FOR HANDI IVG RACKS—
F J I oxany. Ottavia Neb he object of the invention is to provide a dovice especially adapted for placing and removing lay racks and wagns lodder from the running sears of wagons wherein a when supported standard is provided baving means for lifting the rack one end at a those and placing it on the running sear the whools of the rack having means for proventing skidding movement during the lifting of the load

# Of General Interest

FOUNTAIN IEN N. R. D. SMIR BOX 242
Engley Ala. The object of the invention is to
provide a fountain pen wincrein the discharge of
the ink from the reservoir may be nicely controlled to feed any desired amount of ink and wherein the

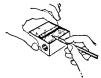


A SECTION OF THE PEN HOLDING PORTION

ed may be retained constantly. An annular scale is provided adjacent to the point to show scale is provined adjacent to the point to show the exact opening of the link valve after the proper regulation of the flow is obtained the valve re-mains in adjusted position to insure the discharge of a constant amount of link. Ordinary pan points may be used with the device.

CONCRETE COMPOSITION—— E Ban GERAUDH 401 Tularess 41 F1 Paso Texas An object of the invention is to provide a concrete which has great strength in comparison with ita weight or in other words a concrete which is wearn: or in other words a concrete which is relatively light. A further only is, is to provide a concrete of a dark color due to the use of crushed rock and assersate of soleants origin known as lava rock without any ad litton of coloring matter. and without the use of ordinacy sand I his concrete is water proof

METALLI ROR AL PROCESS -1 C JONES 420 Union Areado Bldg Pittsburgh Pa An object of this havention is to provide a process in which ores containing from and manganese may be treated economically and in which the iron after tested economicals and in which the real arter its has been reduced to the metallic state may be easily a paraticle from the manganess and in which the manganess may subsequently be reduced to the metallic state and as parated from



A PERSPECTIVE VIEW OF THE SHARD OF

pencil to provide a fixture having renewable sharpening exposed surfaces to furnish in a single apparatus a plurality of sharpening surfaces with sharpening members relatively graduated as to rapidity of operation and to simplify the

direction of the other branch

# Hardware and Taole

Bardware and Tools

WIRS CLAMP—T B. Braverson R. P. D.

No. 4. Darvillo. Va. The invention relatest scennelly to sive change and more particularly to a readily adjustable clamp which will without undue compilession a recommodate a great variety of different gener of whey clamping such gages in an effective manner in connection with the joining of wire ends or other operations.

# Machines and Mechanical Devices

Machinese and Mechanical Devices
ADDING AND AUBI RACTING MACHINE—J. F. ANDERSON 307 London 8t
Natific Wash. The invention relates to calculating machines having a series of number wheels
and selve transmission means for residenting use
hundreds etc. The invention more particularly
relates to a machine wheely the operation of
adding and subtracting may be carried out without may change our self-internet of the number
of any change our self-internet of the number. wheels or other parts and solely through the reverse movement of the operating means thereof

reverse movement of the operating months thereof ROD BE NINOS MACHINER—C. A National Rot 201 (ristobal Canal Zone Panama This invention has for an object the provision of contains tion with his form object to provide a bending machine with a number of bending learning with the production of the production of the second part where the production of the second part of the production of the second part of the production 
RPFPD CHANGE GEARING—A Paars,
21" 4 Broadway Felmond Okla The invention
relates to power transmission mechanism it
being more particularly an object of the invention the main most particularly an object of the invention in to provide a speed or aring including a segment of the drive shaft on which make the main a pair of worm segments are mounted for oedi-all lation and arranged to cooperate with diamond shalp d teeth on the driven disk of the driven shaft

doed to the nations of coal or other carbonarcous material behalf of the sign. In proven requires a relative some amount of coal or other carbonarcous material behalf of the sign of the

| construered of a thin narrow plate of nastal the | This invarieo has for its object to provide a | thread it hid between the curved course ands of Studi measuring affected having a measure tarbor it; pars and record out six an about the six and in the cut the classifity of the play permitted in the cut the six and in the cut the cut the six and in the cut the

which is has been so, has been measured ROTARY PUMP — O Her of Gaujer Ave Jersoy (try N J This invention relates par-ticularly to a redprocating rotary pump and has for an object the provision of an arrangement of warring plair conting with the platon of the pump Involve object is to provide means for adjustance the stroke of the pump when the pump is sistingary or while it is in motion so as so regul late the low of the pump

late the flow of the pump BEAN "PULLIFIED" W NARMOR Mecorn. With The Invention relates to that the flow of polither in which the partialist's to that it yes of polither in which the work of the state 
Memical Devices

BALVO RKSVANOR—I. Yosco 204 W

48th N. New York N. Y. The object of the
words in its provide a construction which will
come to basic of clear toon in rathy or
the construction of the construction of the contraction of the construction of the construction of the
intervention with a resonance so formed as in
terms the construction of the construction of the
construction of the

in al. kinds of weather
Prime Meyers and Their Accessories
GAN TURBINE J TAILOR Commonwealth
Ave sail false (fly Itah The invention relates to gas turbines of that type in which the
twoes in driven by the explosite force of a mixture
of ful and all working in the pockets on the rotor.
The objects were to provide a turbine in which the The objects are to provide a turbine in which the explosive mixture in each pocket is automatically



A TERTRAL SECTION OF THE TURBIES

ignited as the pocket reaches an ignition chamber of such arrangement that finne will propagate from one pocket to the succeeding pocket there being an electric igniter in the chamber for startbeing an electric igniter in the chamber for start-ing purposes also means for supplying priming fuel for starting

Railways and Their Acces Railways and Their Accessories
MFTALING RAILROAD TIE.—C RUGGAREN SAVARIAN US. The object of the invention
is to provide a te having means for rigidly conacting the rails to the the —The device provides
a tle having transverse grooves on tse upper
marker for the seating of the rails, and of a width



Perinalans to Reseastles
TOY PROISCITLE -1. B BLACEMERA.
113 Hotel 8t Honolalu, Terdtory of Hawsii,
This Invention relates more particularly to a
projectile made up of reparable elements adapted
anno it is are constructed and exrange to ave
maintain its assembled form throughout its
trajectory and adapted to be disrupted for a
realistic manner by contact when striking an
object

object TOY TORPEDO —J B BLACKERSAR 113

Hotel St Henotulu. Territory of Hawaii. An object of the invention is to previous to yet open object of the invention is to previous to yet open of the control of the property of the

STEERING WHEEL CONTROL MEANS FOR ELECTRICALLY (PERATED SIGNALS —R 8 HANNA '41 Petersburg Fia One of the principal objects of the invention is to provide means whereby electrically operated signals



EREPRITIVE VIEW OF A STREETING WHEEL THE SLECTBUAL CINCUITS BRING REPRESENTED

varried on a motor car may be controlled and carried on a motor car may be compoued and attasted without the necessity of the driver moving his hands from the steering wheat Another object resides in the arrangement of finger actuated blocks in such a manner that they will not become accidentally depressed by reason of the driver a hands moving into various position

CRAINE HANDER BERRING —C R Mit-Leas 3009 Windoor Ave Kannes City, Miss The invention relates particularly to one-piece creank hancers for bicycles. An object is to pro-vide a bearing characterized by a divisible cone-sea topscher with a divisible assembly slewer which is so coordinated with the shark and create which is so coordinated with the shark and create well see the cup that the whole may be resdily as well as the cup that the whole may be resdily create slipped in position in the slotter with the create slipped in position in the slotter with the create slipped in position in the slotter with the create slipped in position in the slotter with the create slipped in position in the slotter with the create slipped in position in the slotter with the create slipped in position in the slotter with the create slipped in position in the slotter with the create slipped in position in the slotter with the create slipped in the slotter with the create slipped in the create slipped in the slipped sl CRANK HANGER BEARING -

LEAF SPRING -H Broat 800 E 19th LEAF SPRING—H Stear 869 E 10th St Pateren N J The invertion relates to leaf aprings such as are used in automobiles and other vehicles An object is to provide the stock of which the leave are made with inspituolisally extending groone during the process of rolling the stock. The spring is composed of a plurality of superimposed during the process of rolling the stock. The spring is composed of a plurality of superimposed during the process of rolling the stock. The spring is composed of a plurality of superimposed during the process of rolling the strength in the process of rolling the strength in the strength of the process supplying means for labrication. RESILIENT, WHERE!—OR. E. Persented.

leaf the process supplying means for lubrication RESILLENT WHERLI — OF PPTRAGED, Idaho Falls, Idaho. This invention relates to recilient wheels of the type in which as inner wheel rim is cushioned upon a pneumatic tube interposed between the inner wheel rim and the halb of the wheel. Among the principal objects is to provide means for squttient a positive drive between the later with and the inner wheel rim. and means for monthing the wheel on the hilb

We wish to call attention to the fact that we We wish to call actention to she fact it are in a position to rande competent service every branch of patent of trade-mark work staff is composed of mechanical electrical themical experts. thoroughly testined to present presecute all patent applications. Irrupp of the complex nature of the subject-matt

volved or of the specialised technical or exist-title knowledge required therefor. We also have associates throughout the world, who assist in the prosecution of patent and trade-mark applications filed in all countries foreign to the United States.

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LEGAL NOTICES

# PATENTS

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MI communications are structly confidential. Our wast practice, extend no over a period of seventy years and over a period of seventy years are sevent of the period of seventy years any expense to the clent. Our Hand-Book on Patents is sent free on request. This explains our methods, cerus etc. It is a period to the period of the period

SCIENTIFIC AMERICAN section Patent Office Hoten, Decisions of interests in investory—and particulars of recently patented investory—and particulars of re-

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complete with filtering leaves leaves spaced approximately 3" centers Each press equipped with a 9" Hydraulic Cylinder to facilitate opening and closing lower body

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## The Current Supplement

MUCH interest inheres in the tremend ous preparations which the United States had instituted for a gas offensive which would throw completely into the shade anything that the Huns had ever attempted and make them sincerely regret that they had ever started this kind of warfare Manufacturing operations were at the time of the armstree being carried out on a scale truly appaling. The timely story of this work is told in the ourrent issue of the Scientific American Suprimerary No. 2236 for March 22d. under the title Gas Offenswe, A Record Achievement In the same issue a native of Poland and student of Polish history gives an illuminating account of The Nord Forces of Old Poland An important dis-cussion of certain aspects of the crystalline and colloidal states which have heretofore received little attention will be found under the rather awe inspiring title Dispersord clopy An illustrated account of the manu facture of wall paper covers a field which is but little known to the average mortal The mathematically inclined will follow with pleasure the discussion of Stream
Line Motions and Water which carries three illuminating diagrams A surgeon in the I mited States Public Health Se details his observations upon the Flight of Mosquitors through Horizontal Water I spis making some significant suggestions regarding the propagation and prevention of mosquito borne discase The article on issue The important work of the Federal station of areas naturally desert or burned over is described and illustrated in Trees for the Descri in addition there are numerous shorter articles of interest

# The Miami Conservancy Flood Prevention Plan

(Continued from page 283)

(Continued from page 233)

The advasshipty of putting a system of reservoirs in the flooded territory was carefully considered and rejected The failure of the I orane Reservoir in 1913 showed the inefficiency of such a system and no practical network could hold in check. The vant amount of water increasary for protection The engineers finally decided upon five immense retarding basins in different points of the Minns Valley and extensive channel improvements. The it tarding basin or dry basin was better because the farm lands in the basin will be wet the shortest time the basins will be quickly ready for new service in the event of a second storm following the first in close sucrosson during the early part of a storm the beans will be empty and avail ablo to capacity for storing the crest of the flood and the dame being for the creat part of the time will not be so likely 11 become damaged as they would if cou stantly subject to the wash of the water. The retarting beans are coperially good for this kind of work. They are in brail branch of the Great Minni system, how, an enormous dame across the lower portion. These dams are provided with large course. close succession during the early part of a

These dams are provided with large con duts to accommodate the steady fit w of the stream. The conduits are placed at the extreme level and made like long tunnels of huge blocks of concrete based of

hving rock
Lach dam is pierced by two to four such bach dam a pierced by two to four such conduits permanently opened, located at the base of the dam. They are to pass the normal riverflow and in flood to discharge water under head No gates, stopiog notehes or other closure devices are present to encumber the dam. The entire system works allogether automatecelly. The en works altogether automatically. The trance of each of the conduits is prote from drift by concrete piers and a floating

Enormous volumes of water will be dis charged from the conduits at the maximum flood. They are so proportioned in rela-tion to the drainage area and basin as to



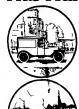
# The World's Most Efficient Small Motor

The small, light-weight, efficient gasoline motor sets new standards in design, manufacture and service of interest to everyone

The Spacke Motor, shown above is a practical power plant-proved by service -thousands are now in use

It actually weighs less than 100 pounds complete. Yet it easily develops from 9 to 13 horse power on less than half the gasoline consumption of the average gasoline engine

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let the hasm all approximately to spillway | Resi Estate, other than in Port in the assumed maximum food Than The Banne spillways, which probably will never be Public Utilines, Relocations used, are provided in case of emergency. And Damages They have from 15 to 19 feet freeboard below the dam crest as a safety margin, which amounts to about 40 per cent over the maximum flood. In floods twice as the maximum flood. In floods twice as large as that of 1913, the dams will have a freeboud of about 15 feet, determined upon the height of the dam

Of the five retarding basins, three he immediately above Dayton in the main streams that join within that city The Taylorsville basin is on the Miami, the ood on Stilly vater, and the Huffman Engia od on Statiwater, and the Atlantana on Mad River These limit the extreme concentration that takes place at the base of the main part of the Valley This section has a very high concentration rate due to the tan-shaped arrangement of the rivers oming together here and the straight

supply channels
Of the other two retarding basins, Lockington controls the Upper Miami, protecting Piqua and Troy, while the Germint wn basin on Twin Creek protects Middletown To develop fully the probably also be affected Similar con-dition apply to the Huffman basin where the cost of more radical adjustment would

It will require three years to build the Englewood basin, the largest of the projetts and three weeks for it to empty a maximum storage It supplements the Hulliam and laylorsville Banns vitally, because it reduces Stillwater River at

of water at high spouting velocities with-out damage. The Taylorsville dam, which has the largest conduits, can discharge 55,000 cul s feet per second, nearly as much as the present safe flood-flow capacity of the Miami Channel The velocity of the discharge had to be brought down from some 50 feet per second to six or eight feet by use of the hydraulic numr standing wave, stabilized by steps and tailuster were

The construction of the retarding basins and the terror of the lockout, these a necessitates the purchase of much splendid farmland and the changing of many miles of railroad track. For the Huffman basin of milroad track. For the Huffman basin the mun line of the Eyre Railroad will be changed for 80 000 feet and the Oho Electric Railway for 67,000 feet for the Invloreville basin, the B & O Railroad will be changed along 65,000 feet, and the Big Four along 15 miles. The word commenced over five years ago and will probably be finished about five years from the time. The state of the control of t from the time The total cost of the propert will run about \$25,000,000 and will be raised by special taxation graduated proportionately to the benefit The whole Minn: River Valley will be influenced. The rich land within the basins will be leased and cultivated as heretofore, the ses alone being moved to higher ground The fact that most of the land will probably never be flooded makes cultivation a good risk The following table, showing the cost of the main items of the work, will give an idea of the disbursement of the

Retarding Basins, not including \$6,785,090 Real I state
Real I state in Basins
Channel Work and Local Pro-8,500,000 taction .. 8.468.000

2,209,000

Total, not including interes taxes, administration and

\$18,210,000 contingencies One epoch making departure from pre-cedent in this work is a fact that no steam codent in this work is a fact that no steam shovels are used. Huge dragine ca-cavators, the largest made, are employed throughout Most of them are electrically operated. They carry 138-feet borns with bucket capacity of 3-½ cubic yards, and revolve completely without changing their position. Others have from 85- be 100-feet booms carrying five-cubic-yard their position Others have from 88- to 100-foot booms earrying five-unio-yard buckets, taking in one scoop five wagon-loads of dirt. It will be remembered that the Panama Canal engineers used only steam shovels and thus had very limited radius. The radius of action of Manufi Conservancy dragline excavators covers

Own 100 feet

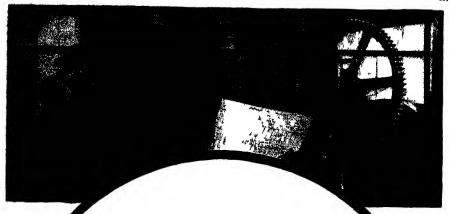
Much legal procedure was necessary
before the work could be got under way.
Chief Engineer Morgan drafted the Conteets Middtown To develop fully the Course support the Course of Tpy inner city, a village five miles last of Tpy inner city, a village five miles last of the dam, and Troy and septedal assessment leved to pay for above the att of the dam, and Troy and septedal assessment leved to pay for course, and the text was passed without receival ly also be affected. Similar convenient the course of t validity of the law in many ways and it was not until June, 1915, that the Miami he is histories. The appearance was the conservance Dataries was wented daypend beautior at of smaller capacity than the disputies as legal department under the others in ristino to their position and blate. An immense bond issue was draming, area. The table which we print flowed to carry the work until the assessment of the conservance of the conservan dispute as a legal department under the ments could be collected, and \$10,000,000 worth were sold in Dayton alone The district employs about 1,600 men noted engineering authorities are con-nected with the work besides the Chaf-kngneer Chas H Hall, the assistant engineer, built the Arrow Rock Dam maximum storage. It supplements the engineer, built the Arrow Rock Dam Bullium and Iaylorsulle Blassan vitally, in Idaho, which at that time was the beraisw it reduces Stillwater River at highest masonry dam in the world Charles Daylin in from 8000 to 12,000 second-feet II Locker, who has done a great deal of The construction of the retarding beants it for limit of automatic They do not require constant care and are so constructed Matthew, the office engineer, was in charge that it is will be in as good condition a contruly from now even at totally neglected, as it is will be the day they are finished in the control of rainfall data during control in the day they are finished in the control of rainfall data during the control of the condition of rainfall data during control in the day they are finished in the control of rainfall data during control in the day they are finished in the control of the control o tensive and include despening and straightening the channels of the various streams in the Great Miami Valley, and strengthenin the Great Milami valley, and strengthen-ing the levees. It is a work not only for the present but for future generations and will last for probably three centuries with very little or no improvement.

# Reconstruction in Europ

(Continued from page 284)

no less pressing now than ever The difference is that now labor has a share in difference is that now labor has a share in the working out of the policies which will avoid such difficulties, and can aid in shaping the destinies of industry as well as of trades unions, to the mutual advantage of nation and worker, whose previously labor could but recent after trouble had come, or suffer after injustice had been

As has been sketched in previous artucles in this series, the provenment is endeavoring by every means in its power to discount that dreaded period of transition from a war to a peace basis, and to beep a sense balance in most sminds by many means, chief of which is an unsemployment benefit of 24 shillings a west for 18 weeks during the six months beginning November 2548, with additional sums for dependent chiff-dren Demobilisation is not to be carried out at a speed which will paralyse industry's ability to resbesch Recognition meanres are tadder way that will start up many public works, that will start up many public works, that will solve to some creater at least the very pressung housing problem, that will produce new sources of wood argusty by reformations. As has been sketched in previous articles new sources of wood supply by reformatation, that will both reclaim land now wanted and



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Wire Rope for every purpose These grades have been carefully etandardized and the steadards are rigidly meinteined Because wire of suitably high grade for our yellow tired Wire Rope could not be obtained during the war, the measurature of Yellow Strand was temporarily suspended Yellow Strand was temporarily suspended but will soon he resumed

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# SCIENTIFIC AMERICAN

New York City

## Reconstruction in Europe (Continued from page 200)

make available for cultivation land now held in parks and estates that will in a hundred other ways directly affect the comf it and the life of the individual Adult education is getting much attention Adult dutation is getting much attention as at extension courses for soliders in proc so if demobilisation, and a general attempt is being carnestly made by the entir government to bring capital and labor industry and craftsman, to a state of mutual confidence and mutual for-bearance during the difficult years just

How the problem will finally find solution no man may guess. But labor as a class has so whole-heartedly and so magnificently got on with the war that to the onlooker from another land, it does us as if the government had been wise seem as it the government used been when in time and as if it were not possible for labur as a class, either to raise the snake-like head f Bolshevism or seriously to em-barrass what they naturally consider to be the gratest nation in the world, in her progress towards a newer and a better national life

# [How Will the Gasoline Engine Develop?

(Continued from page 285)

soon reach a temperature at which they would lose their strength and disrupt As for the 38 per cent of heat that passes out through the exhaust pipe in the form of gas at high pressure, attempts have been made to utilize it by expanding the gas a see nd time in a larger cylinder-as is done in steam-engine practice, likewise by giving the piston a variable stroke, the intake being short and the expansion stroke proportionately long to carry expansion to a comparatively low pressure. These and other expedients have been more or less exhaustively tried out but they have added so much weight and complication and noise and expense that none has ever got much past the experimental

Such roughly, is the present state of affairs Suppose we consider for a molooking toward greater efficiency. So far as thermal efficiency is concerned the best results are obtained with a single cylinder Sweeping all detailed discussion aside however the single cylinder engine is im practi able as we now know it for anything

except stationary and heavy marine work
It is apparent however that the ex
pedi at of multiplying cylinders is simply the cassest way we have for making the the matter and channating the evil present tendency toward designs in which each mdividual cylinder is brought to a bigher efficiency. One automobile manu-fa turer has succeeded in increasing the maximum power of a six-cylinder engine appreximately forty per cent by using two intak and two exhaust valves instead of the usual one and has mercased the overall office new about thirty per cent all by just mains, it cases for the gases to get in and out Similar and equally good results have been brained by makers of four cylinder ones Higher power greater flexibility lier fuel consumption all have been obt med without increasing cylinder di

velopment of another method of lubifor-tion, is something that holds out further-hope. As a matter of fact there is available a lubroant that remains unaffected able a lubroant that remains unaffered by any such temperatures as are attained in internal combustion sengines. I refer to graphite, which is constaintly finding new uses and extensions of eld uses it has a strong simility for east root, and the davelopment of means for using it in cylinder lubriation does not seem impossible. This would permit a working interpretute probably higher than present cost trons would stand. Should this some cost trons would stand. Should this some trans it would be un to the metallurseists. to pass it would be up to the metallurgists to produce a metal that would support the

temperature Another point here the running of an engine at temperatures considerably higher than at present possible would probable eliminate water-cooling, it would be a matter of annal difficulty to carry off, by air alone, the heat that could not be converted into power Perhaps it could even be done without the weight-adding fins and flanges that are now necessary cooled cylinders

One result of such a development w One result of such a development would be greatly to reduce the weight and size for a given power output. In the case of the automobile engine, this would have unportant effects upon the design of the car as a whole At present the chassis must be strong in proportion to the weight of the engine. The lightening of the engine would permit the lightening of the engine would permit the lightening of the whole ear A case in point is that of a manufacturer who, a few years ago, worked out an engine with an aluminum cylinder block, in which light east-iron liners took the wear of the pustons With-out reducing the power or the capacity of the car the weight was cut down more than helf. See the control of the capacity of

While on the subject of weight it may be pointed out that there are great possibilities. pointed out that there are given pointed the in the much neglected two-stroke cycle points the way it is highly probable that had this principle been adopted as has the four-cycle bad it been the subject of the same general concentration it would have developed into something much better than any tlung we now have The four-cycle engine has been so close to our eyes that it has been difficult to see anything else, but its further development along its present lines appears to offer opportunities that are small in comparison with those of the able to assume that at no distant date the latter will be taken up by the engineering world more seriously than here

Already we know that it is entirely possible nearly and in a few cases actually. to double the power of a ryinder of given dimensions by substituting the two-stroke cycle for the four. This would not scroce cycle for the four. This would not mean cutting the weight in two, for the shaft, connecting-rods and case must be sufficiently substantial to take the additional stresses But carry the matter to its logical conclusion and let one cylinder do what a steam-engine cylinder does provide an impulse at every piston stroke, two impulses for every revolution of the shaft Or we may leap boldly over a whole catalog of its and buts to foresee, as one of the engines of the future, one with a single cylinder working on the two-cycle prinplosion at every piston stroke

mere sine. Much hase heen and is being don't be controlling heat which means don't be controlling heat which means the state of the properties of the proper This would involve something more



capable of an infinite number of combinations for every purpose.

Any size or shape of comparting form of structure as the turtle sin his meet can be formed in a minute by change of spacing; all parts to Grand Structure as the turtle sin his meet can be formed in a minute by change of spacing; all parts to Dr Gernit S Miller Curator of Mammala are accurate and smooth-fitting. when not needed, and stored away compactly or re-set up elsewhere

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DURAND consideration instead of the first question to be settled. The many attempts that have been made to mount the engine on Steel Racks the rear sale are at one brought to many both and the sale are at one brought to many both picture and the demanstran of the grant needed to transmit power all the sale are as a sale are at one brought to be a help materially in reducing weight and wearing parts
Of course all this is speculative

by no means wild speculation so long as we keep firmly in mind the fact that the future keep army in mind the lact that the luture is certain to bring knowledge that does not now exist. It is unthinkable that such should not be the case that we are any where near the end of our scientific rope. where near the end of our scientills rope It is no more unreason able to think on such lines than it would have been, 20 years ago, to build on the possibilities following the general use of a metal almost as atrong as east ron and of but a third its weight of steels that would hold their quitting, edges when red hot of power plants weighing little more than two pounds per horse-power of the aucossful heavier-

DURAND Steel Racks, with adjustable shelves, bin fronts, dividers, etc., are

# The Vampire Bat

(Continued from page \$87)

of the Smithsonian Institution, who wrote the government work on bats, thinks that An entire bin can be removed easily this bat took a very long time in which to become the sole vampire extant He writes me
The only objection I have to your pr

posed period of two million years is that it seems to me the period is quite inadequate to allow for the development of the dif DURAND STEEL LOCKER CO. foreness between the vampire bate and the fruit-rating bate 1 personally have no doubt that both families had essentially their present characteristics at the bottom of the Locene Age That would all another million years and mean that when first mammals arose in the Tertiary, blord sucking bats ar ise with them to discourage their proposed reign on earth 1 always assume in estimates of geologic time that first comers of each new age were allowed a little time to get used to conditions and tablish themselves before pests cam help TO-DAY

oven Passe cannot bring bask the dead soldier to his child

THEREGREGE

Equally important from the standprint 10 ca Day of auturalists in the large collection of \$3 0.0 a Month or \$3.0 5.0 a Year the Conso which are now being perpert the Conso which are now being perpert for exhibition at the American Museum Lis Name and Address will be sent you a request when the year of Suth America, ex. [4] in outward appearance when in dight and in the haltes of all bate of hanging it there with the control of the gave up his forearms and inagers to form his parachute of wings. In consequence in order that he might have a and deep wings as possible his hind claws were attached to the bottom of the spingfor grasping and not for walking Humans cannot stand on their heads long because of the rush of blood the wrong way. It but however has a compressed cheet by which it controls the flow of blood. So when he hangs himself head downwar! when he hange inneed had downlyss I has blood created as normally as whos in flight. He san only more slong the ground by ald of he wings halands jin fept, and then move as if a victim of abolptions of the first than the same and the move as if a victim of abolptions of the first than the same and the s









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SCIENTIFIC AMERICAN PUBLISHING CO. New York, N. Y. Woolworth Building



Chapin states, among much else Chapsu valete, among much eise
"Th collection consists of 794 specissees, 1 presenting 68 forms of bets not
hesetor in known to this runs un, and
other moss mus of this country have compractively that 01 those 29 are new
species and two are new sub-species, not
known in any museum of the old world.
They are collected in 27 localities, in each
of whin he splice autom radiated 90 miles from camps cupied The area covered was the wrst African rain forest, 4,000 miles long and 450 miles wide Fruit late are naturally common therein, where fruit ripeas the raighout the year Since fruits are not qually plentful in all locations, fruit-centing heat have to elift constantily, being unable snywher to have cetablished roosts. Her only possible solution of the food quyston is large flights in great numbers, with in thirth date nor locality—just luming until they find fruit in Season prices bull posteriors out the procession of the food of the state of the food of the state of the food of the state of of the quitor, but journeys must be made by the bats to adapt themselves to fruitsaring periods, even if desert wastes must be gross ! Since fruit is their only food, the cross of since truit is their only tood, it is he it possible that there eves alone, though relatively large, should suffice to discover it. Their great flights, resembling migrations makes us feel sure that their sense of smell is very highly developed, and our experiments show that it is probably their principal guide, since the fragrance of ripe fruits is often very strong. In nearly all fruit late the nasal region is extremely all fruit late the nasal region is extremely long with well developed ethnoids as a special privision for the highly sensitive organs of simil. The large olfactory lobes also she w that small with them is a very few exceptions in clongate and rather smooth in outline. The brain cavity is rather small, a certain sluggishness in temper and action distinguishing them from the more active maectiverous and fruit-ning bats

The mandible with its long interrupted The mandible with its long interrupted tooth row is slender and wask, and is operated by rather poorly developed jaw muscles. The canine tech are fairly long, rather dull, and often round in the transverse section fit for wrenching off, enting ops fruits or holding them in the mouth during flight. The cheek teeth, with trowns often narrow, are rather degenerate and are cheffly of assurance in separating the pulp from the fiber, as in manges so in equeuing out juices from the pulp. Their food requires little or no mastic tions. mastic ition

"The very extensible tongue is beset on top with gustatory and tactual papilise The latter are often arranged in a patch near the tip tridentate and stiff enough to serve as a rasp, helpful in gathering pu and purces from inside the fruits after their outer cover has been torn In some specie juices of fruits are also sucked by means of extensive pouches underneath the lips The digestion is extremely rapid and the quantities of fruit or their juices consumed quantities of fruit or their juices consumed are large. Hence the great patches of apparently fresh pulp, together with the remants of spoiled fruit, underneath boughs that seem to be used as habitual dising

that soom to be used as habitual distingt gas in severation suitable elegating the half and the second of the condensation, but the transportation of these frusts before feeding, sometimes gave to be considerable, but the transportation of these frusts before feeding, sometimes gave the second sprout readily and grow into symmetry and the second sprout readily and grow into symmetry and the second sprout readily and grow into symmetry and the second sprout readily and grow into symmetry and the second sprout readily and grow into symmetry and the second sprout readily and grow into symmetry and second sprout the second sprout treating a first part of the second sprout treating and second sprout the second sprout treating and second second sprout treating and second sec

mouth hips and fonguo so as to suck and dig out the contents of an apple or other fruit Dr. nor Shilletin of the American Museum, African fruit-sating basi. We illustrate it, Gongo beposition Collection of Basis, by J. A Allen, Herbert Lang and James P J. A Allen, Herbert Lang and James P

# U. S. Navy 7-inch Caterolliar Mount (Continued from page 287)

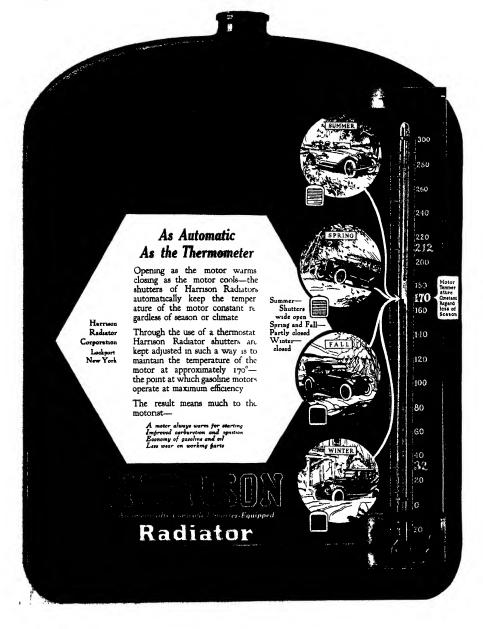
mobile, it had to be ready to move immediately after firing the hast shot. This requisite was obtained. The carriage or is designed to the carriage of the car

mobiles, it had to be ready to move immediately after frame the inst abot. This requisite was obtained. The carriage or tractor mount as it a designated coissess tractor of the carriage of tractors of the carriage of the control of the carriage of the carriage trail. The carriage card trail thus form a rand suit said are supported on a forged alley steel aske somethy of the carriage trail. The carriage lands of the lower extremities of the transition bearing plates. The carriage lands of the supported on the lower extremities of the trainion bearing plates. The carriage lands of the supported o would have had to be at least 20 feet in deameter

cannever

The seven-inch gun weighing 28,760
pounds is mounted in a cast-steel slide
secured by cap squares in trunnion bearings on the upper extremities of the trunnion bearing plates. Momentum of recoil and counter-trovol is checked and shorrhed by means of a hydraulte brake such as is fitted to all naval gun mounts. The pnesumatte counter recoil system, s., the mechanism installed for the purpose of returning the gun battery after firing is an innovation to naval ordenance. Sessotially it consists of an air cylinder mounted on top of the slide within which operates a parton connected to the gun yole by neasure system connected to the gun yole by neasure cylinder is another cylinder which serves as a reservoir. The system is initially charged with air at 300 pounds per square land. and counter-recoil is checked and abs

inch. Whenever the gun is fired at a maximum slavation of 40 degrees the air is further compressed to 550 pounds which is self-ficient to return the gun to bestery. Sighting arrangements pervise for book direct and indivest fire. For leaving the gun is elevation exitative advantage que in provided and invaled steps in assumpth is according to the contract of the c



# Frederick Palmer in Collier's

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two-senter, these machines are singleis a two-searer, these mashines are single-metters. It is hoped that at an early date these various machines will compete in a race which will soon establish the undus-puted supremise of one of the three types, unce it is obvious that all three cannot lay claim to the same title when all the figures do not agree. And again, it is not so long ago that 150 miles per hour was considered the god of the fast plane. It seems rather den for planes to have gone up to ove 160 miles an hour. The more skeptical among laymen demand actual and official ligures rather than mere estimates

Turning from the military planes to sport or civilian planes, the visitor found much of interest First of all there was the bisarre little Gallaudet twin-pusher monoplane known as the "Chummy Flysbout"
This plane has a span of 33 feet, and is equippe I with two-motor-cycle engines of 20 hr -power each. The engines are used t gether in driving the pair of pusher used it is there in cirving the pair of pusher propell r- but should one engine fail the other would continue to drive both propellers through a system of shafts and bevel garring. Two sexts are provided in this sport plane arranged side by side just this sport plane arranged more by side just behind the two engines in the nose of the monocynu fuselage Light gallons of fuel 1 carried which is sufficient for a two-hour flight. The machine weighs 750 pounds but the designer states that it will soon by reduced to 690 pounds as a result soon is reduced to not pounds as a result of certain improvements and modifications With full load a speed of 40 to 80 miles an hour is claimed for the Gallaudet 'Chummy Flyabout' The cost is \$3 500 at present

Another sport plane is the Dayton-Another sport plane is the Dayton-wright 1-4 Messenger, a war machine made over for ervilian use. As a military machin: it was intended for carrying messages from the frunt lines to hasd-quarters and for general lasson work. The Missinger is a conventional bi-plane with a wing span of 19 feet 3 inches a wint of 675 nounds loaded, and extracplane with a wing span of twicer a money a weight of 636 pounds loaded, and carries an air coded De Palma engine of 47 horse power. Twelve gallons of fuel is carried which is sufficient for a three-hour flight The machine has a speed of 85 miles in hour and can climb to 5 000 feet in ten minutes according to the manufacturers s machine sells for \$2 500

While not intended at the present moment as a sport or civilian machine, the Loening M-2 baby sesplane, which has been used by the Navy for submarine patrol work is prhaps the smallest scaplane ever luit for practical work. It occupies so little space that it can readily be packed aboard csubmarine. It is a tractor monoaboard tsubmarne. It is a tractor mono-plane with two floats. The plane has a span of 1) feet and a chord of four. The engine is a three-cylinder Lawrence 60 horse-p wer air cooled. Twelve gallons of fuel is carried which is sufficient for a two-hour flight I ully loaded, the maximum weight but 500 pounds. The inaximum speed is said to be 100 miles an hour, and the lowest 50 miles an hour.

To one unfamiliar with the broad and highly telinical subject of aerodynamics, the matter of horse-power and speed seems most purpling and inconsistent. On the one hand we find a single-seater military plane making 130 miles an hour with a 300 hors power engine, and on the other a smiltr plane making 80 with but 40 horse power who such a prest difference in his procure in his programmer. The answer is that horse power and speed do not keep in perfect step. That is to say, as the speed demant in treases, the horse power of the second demant in treases, the horse power of the second demant in treases, the horse-power does deman i mereases, the horse-power does not rise in arithmetic progression, such as 1,2 3 and so on, but in geometric progression, such as 2 4, 16 32, and so on Every 10 miles above 100 miles an hour calls for 10 miles above 100 miles an hour calls for tor there draws out a thread to mark the a vast increase in horse-power, until 300 line of direction between the ship and the mand 400 and more horse-power is required compass station. As the other bearings are when 150 miles an hour is reached. That imported, similar marks are laid down; it why a will-described similar state of the discourse termination.

New York's Aeronautical Expection power, whereas it requires eight and system times that power to double the specific power.

Acrial luxuumne, or enclosed multi-se Acrial impossine, or enclosed mater mesor planes, were shown at the Exposition, with elaborate fixtures and numerous comforts for those who desire to fly rather than ride from place to place. In fact, this matter of aerial limousnes indicates how military planes of the two-seater type can be readily converted into social machines, with little trouble and ex-

That naval aggraft have kept up wi That neval aircraft neve upp up with military aircraft, despite the rapid ad-vances of the latter, is quite evident. The Exposition disclosed high speed single-seater naval souts with speeds closs to those of the regular run of military airplanes Then there are the buge anti-submarine patrol eraft, such as the Liberty engined biplanes of our Navy, constructed at the Naval Aircraft Factory in Phila-delphia. In fact, when the matter of civilian flying is considered from a really personal point of view, nine chances out of ten the seaplane and the flying boat types are the most attractive. The starting and alighting problem is far simpler with aquatic aircraft than with

simpler with aquatic aircraft than with those which land on solid earth. Four and a half years of war have given us several reliable power plants for our airplance. The necessity of detecting and reporting enemy movements, defences, gun emplacement and so on hes given us a large collection of cameras and wonderful photographic apparatus The demands of military aviators have given us excellent aeronautical instruments for measuring altitude speed, drift, inclination and so or all these things were on display at the recent Laposition

If the present design of the surplane is to be accepted as final, then the airplane is practically perfected. There seems little more that can be done in the way of spec-tacular advances, for the present machines carry great weights, can make high speeds, climb thousands of feet in a few minutes,

and are quite rollable, especially in the case of the multiple-engined planes

btill, when it comes to long distances and sustained flight for many hours, the dirigible will no doubt be the craft adopted for commercial purposes. A daugible us-ing helium gas is practically a perfected eraft, it can be made 800 or 1,000 feet long. with a diameter of 80 or 100 feet, it can carry 20 to 30 tons of useful load, and it can readily be made for a cruising radius of 7,500 miles! For inter-continental transportation for trans-oceanic flights, and for long-distance travel generally the dirigible is the craft of the future. It can handle passengers at a far lesser cost for distances over 500 miles When it comes to short lower 600 miles When it comes to short journeys, however, say between London and Paris, New York and Washington, sad Paris and Brusels, the large airplans, capable of carrying twelve to journean passengars, is undoubtedly superior be cause of its high speed over routes where Yearns and fast tessmers have to be com-peted with 80 for "lops" or short lightle, the surplane is destined to be the winged carrier of passengers, mails and light merchandise, while for long journeys the airship will no doubt be the uncha lenged transport. It is a far cry from the captive balloons and small Naval dirigible exhibited at the Aeronautical Exposition but to those who have been following the march of aviation events there is no doubt that they represent the opping commercial

# The Wireless Compans

(Continued from page 891)

are then led through the holes and laid out on the map When a compass station sends a bearing to the control station, the operais why a well-designed single-seater can and the point where all the threads intermake 70 or 80 miles an hour on 40 house least to the all the threads intermake 70 or 80 miles an hour on 40 house least to the all the threads intermake 10 or 80 miles an hour on 40 house least to the all the threads intermake 10 or 80 miles and hour on 40 house least to the same least to



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w surior of outpropring two more through stage and instructive book for beyong as have many big things in engineering have necessification.

desiring to know its position Some times all the bearings riported do not intersect when diagramed on the map with black thread. Then the space enclosed by the various intersecting points designates the area in which the ship may be

In the immediate future overy America port will be safeguarded by a system of radio compasses and control stations radio compasses and control stations. Then, at any point along the coast mariners will be enabled to check up bearings obtained in the old way and need never fear musaing the channel on a foggy might or in a rough sea

# The Aerial Police

The Aerial Police
IN southern Teasa where the pink boilI worm has been trying to invede the
United States from Mexico there are
cotton free sones declared by law as
barriers against the progress of the worm
But a few misguided farmers feel that their
rights have been infringed and have at
coordingly developed a kindency to become
outlaw farmers. Much of the country is
beavily timbered. Roads are neither
the country of the country is
beavily timbered. Roads are neither
to ran outlaw planter to tuck away a few
acres of cotton in some nook of the weods
beyond the probability of discovery ty
ordinary means though the Department
of Agriculture was making deligent efforts
to apolt every stalk of cotton in the quarantimed area. ed area

Last year the Department took ad vantage of an offer to try out the airplane for this acouting work. With its aid seven outlaw cotton fields were discovered in the heavily wooded country along the Trinity River and around Galveston Bay fields which had escaped discovery by all

other means Similar exploration and control work h since been extended and will doubtless be continued as long as the cotton quarantine exists Photographic maps have been prepared of the entire district between the Brases and Neches Rivers and have been liftages and Neches Rivers and have been found of great service in keeping this area under survey and observation. Panofamic views of the country bordering the quarantine lines are made to note the character and extent of any forests or wooded areas which might act as a natural barrier to the spread of the bolloworth through flight the moth as well as to secure some idea of the value of aerial observations in con nection with entomological work and

ar outing Flights were made at an altitude of 1 500 to 2 000 feet. At this elevation on a cuarray distinct vision could be had of the country over a range of 30 miles and oul tivated fields buildings shell roads, rail way lines creeks and the character of wooded are is—whether evergreen or de-aduous could be easily distinguished. At the normal airplane speed of 75 miles per hour the ground moves so slowly, when observed from this height that the observer has time to get a complete picture of the area and to make an easy distinction between outton and corn-fields

After reporting in detail on the natural in his belief that the airplane will tre-mendously facilitate all such scouting and amounts and a near development of the control of th nee work including mapp putting before the violator of the law and threat that an eagle-eyed officer of justice may drop upon him at any moment from the sky, the new undertaking seems to be of coundwible permanent scientific

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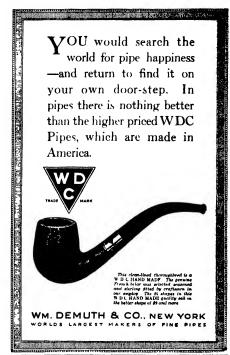
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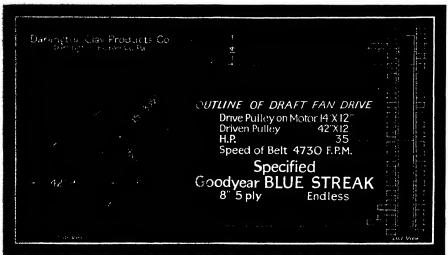
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Conscient 1919 by The Goodwar Tire & Rubber Co

# What Came of a Letter—and a G.T.M. Call

\$123.83 has been saved in seven months on the draft-fan drive of the Darlington Clay Products Company. The best belt they had ever had on that drive gave service at a cost of \$25 32 per month. The Goodyear Belt recommended by a G. T. M.—Goodyear Technical Man—has cost only \$7.63 per month. In the last seven months, therefore, the G. T. M.'s service has saved \$123 83—and will save more in the months to come. Even more important to Mr. Teffit, the manager, there is no more trouble on that drive. A letter of inquiry written to Akron by Mr. Tefft was the first cause of these gratifying results.

In it he described his draft-fan drive and the trouble and expense it was causing. He wrote that the belt ran between the brick walls of a pit—coming to within an inch of walls often at a tem perature of 300 degrees. He stated that sulphur fumes—SO2—went over the belt, and that the inghtman in oling the fan bear ings generally let oil drip on the belt. He added that the best belt he had been able to get gave about 8 months' service at a cost of \$202 61—\$25 32 per month—and lots of trouble and repairs thrown in for good measure

We sent a G.T.M.—our Mr. Hunter—to look the drive over He decided that as it stood it would always be expensive and troublesom—even if Goodyear Belts specified by a G.T.M. were used. So he put up as oil guard at the right place—had a hole cut in the wall to provide a draft to carry off the heat—and after careful measurements specified an 8 inch 5 ply Goodyear Blue Streak made endless. It cost \$53.41 and was applied June 5th, 1918.

On January 5th, 1919, at the time this advertisement went to press the belt was still running. It had given seven months service at a cost of \$763 per month—had never required repairs or other attention, and to Mr. Tofft looked good for months more of perfect service. It does better work than the former belt which cost at least \$17.69 more per month of service. Mr. Tofft attributes the consequent saving of \$123.83 in seven months, and the relief from trouble to the C. T. M. he has had a G. T. M. analyze and prescribe a belt f revery driven in the plant and has already ordered the pres nibed Goodyear equipment for five drives.

If you have a belt devouring drive that is eating too many dollars ask a GTM t call. Hell do it without charge when he in your vi. iv. There are many of them, all trained in the Goodvear Techr. al. Sch. 1 all with experience in plants similar to yours all sed in, belts timeet conditions and not as a hard ware mish sells in his. We are able to give the GTM is services free only between the savings they effect for purchasers are so considerable that a trainfying volume of business from the plants analyzed is sure to result within a year or two. The G.TM. sanalyzes and prescriptions do not obligate you in any way.

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO





SCIENTIFIC AMERICAN



Vol. CSEX. No. 13 Minch NO. 1918 Scientific Amer Publishing Co. Mana & Colley York, N. Y. Price 10 Cents



'Nobby Cords' are big -husky-incredibly strong.

Layer on layer of tough, powerful cords from a tire wall that is virtually impervious to wear—a perfect base for the great thick non-skid tread

Each layer of cords is imbedded in live, springy rubber This gives a flexibility that robs the road of its roughness, cushions the load and lets you speed up your truck with safety Twenty miles an hour, if you like, even with fragile loads

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By absorbing the impact of the road, they keep

your truck out of the repair shop, lengthen its life and reduce replacements of parts Many users estimate that 'Nobby Cords' reduce depreciation of their vehicles 50 per cent

Naturally enough, the smoother operation of the truck saves materially in gas and oil consumption—frequently as much as 30 to 40 per cent

Nobby Cords' can be put on or taken off, same as the tires on your passenger car—and with as little trouble or delay

Our nearest Truck Tire Sales and Service Depot can supply you with 'Nobby Cords'



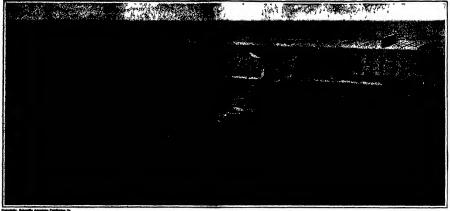
# SEVENTY-FIFTH YEAR (MINIMESSAMENIA)

# THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

AGT THE CKX

NEW YORK, MARCH 29, 1919

10 CENTS A COPY



os Leading a sespiane aboard one of the sespiane-tewing burges of the British Navy, by means of a hand-operated windiase

# A Towing Burge for the Huge Naval Planes

A Towing Starge for the futge Naval Planes

AVAL switch was developed to a far greater extent

during the war than the public was permitted to

believe Unitte unitary avistion, where the developments and tenisences were more or less known to the

world at large during the war, neval avistion has been

eashrouded in the blackest and most impenetrable anoke

earem of the cenors, indeed, it is only during the past

few days that the facts are becoming known as regards

the winged branch of the naval forces
Along with the diminutive Sopwith single-scater biplanes which the British Navy faunched from platforms erected on a pair of long gans of any cruser, it is now divulged for the first time that both British and American naval forces made use of and American naval forces made use of towns barges or lighters for transporting big escalance to distant points. These barges reved the purpose of towns gea-plance to somewhere usar enemy points, by means of fast torped-boat destreyers, so as to lessen the flying distance. It will be noted from the accompanying distantance, that these barees follow the

It will be noted from the accompanying illustrations that these barges follow the usual hydroplane lines: A compartment at the rear of the craft as employed as a trimming tank, which is blowed out by compartment in the company of t

on a pair of rails. This trolley is composed of two parts the after part being hinged to the foremost or main portion. The forepart is carried out en flanged rollers each 3 inches in diameter and 2½ inches wide on the bearing surface. The top of it framework of the eradle is laid with portable sets of fir buttens. Clips to prevent the trolley infung from the rails are provided. Also four automatic binged catches are precised of reholding the results in the second processing and the storing the results. the eradic in the receiving posit on and in the stowing position

From what has already been read at will be noted that

the scapiane or flying boat is stowed on the cradle running on the fore and aft rails on the inner bottom of the lighter on the fore and aft rails on the inner posters in the tradic is run down.

To ship the flying boat or seaplant, the tradic is run down. to saip the nying one or seapant. Lit oranie for in the trails to the extreme after end of the lighter. The later is then frimmed down aft by flooding a water balliast compartment by means of a kingston valve sufficient draught of water being obtained to allow of the flying boat or scaplane bung floated on to the cradle

the cradle with its load is now hailed up the rails by means of the hand windless at the bow to the stowing position which is approximately midships where it is secured. The water in the ballast com-

partment at the rear is then blown out by compressed air stored in bottles carried on board the lighter bringing the traft to an even keel for towing. The towing eyes are fitted to each side of the barge some distance back from the low in bridle being used. By this me ms any trudency for the lighter to deviate fr in her true course is corrected by one or the other of the legs of the fruile bearing on the forepart of the lighter and thus bringing her back to her Three skegs are fitted aft for the same purpose

It is said that these lighters have been towed by destroyers at speeds up to 35 knots with flying boats on board. To knots with fixing boats on board. To privent the fixing boat or maphair as the case may be from lifting off the trolly when the barge is being towed at high speed two wing supports are provided at each side. When the desired point for making an attack is reached the plane is launched byreversing the loading operation. In the upper illustration is depicted the method of shipping the seaplalane while the lower shows the barge under way



from speed despitute on beard a barge which is towed sometimes at the rate of 65 knees an hear ,

# SCIENTIFIC AMERICAN

Published by Scientific American Publishing Co Founded 1845 New York, Saturday, March 29, 1919 Musa & Co 233 Broadway New York

Charles Aller Mr. 1. 1. sleet. Open D. M. sr. Persaurer All C. If Rr. 3s. starty all at 273 Br. sleet. 1. to 1. Cline 1 at 301. P. N. S. W. N. 1. see ... 11 Close Mitter 1 ra. Mark It siders of th. 1 led State 1 bert C. B. C. 13 distribution 4. M. Augerian 1 Bell C. (Freal Bit. 16 Etc.) er sc. 1. Starty and 1. Self. Sec. 1 
The object of the journal bettered uses toly an

The object of the journal set and new tely and weathy the latest sentify mechanical side would never of the day. Leavest provide the way a possion to announce interesting developments before they are sublished is limited.

The Litter is glad to lace submitted to him timely acticles suitable for the columns especially when such articles are accompanied by photographs

# Hurley and the Shipping Situation

HF Chairman of the United States Shipping Board returns from his three months stay in l grope with a mass of first-hand information regarding the shipping situation in the maritime world, and the American public will be glad to know that one offect of his investigation has been to make him very optimistic as to the future of American shipping. He believes that the obstacle of mexperience will quickly give way before American industrial strength and energy Our progress will be facilitated by the widespread upheaval which has occurred in the maritime world evidence of the changed conditions he makes the startling statement that the difference in wages here and abroad is today practically negligible the pay given to British seamen during the war being \$72 a month as compared with our pay of \$75 a month Furthermore, ould have us remember that wages form only a part of the assues now raised by the seamen of the world He found that the conditions of living for the seamen aboard ship and the recognition of their rights as citizens, even upon the sea overshadow the wage question own Shipping Board has provided comfortable quarters

"fit for Americans to live in—and says Mr Hurley.

The seamen of other nations as I found during my stay
abroad, are infinit upon obtaining the same treatment
aboard ship—Ano live rifect which will undoublictly
be of great assentance to our increhant marries was the
action of the Commission of International Labor Legislation, appointd by the Piace Conference at Paris which
has accepted the principle of uniformity throughout the
world of seamen a wager

Fyeryone is interested, or should be, to know exactly what has been the effect of the war upon the shipping tonnage of the world and Mr Hurley a figures may be taken as the latest and most accurate. From them we learn that the steam scagoing merchant tonnage of the world in July 1914 was 41 225 000 gross tons that there has been a net loss of 4 245 000 tons and that to this should be added the loss through failure of normal increase his new construction of 12 000 000 tone making a present world shortage over what would have been atloat had the war never occurred of 16 245 000 The losses to the Albes and neutrals by emmy action by marine risk and by capture or seizure by the enemy, amounted to 15 218 000 tons. The Allied gains during the war were by new construction 11.856,000 gross tons and by capture or seizure from the enemy 2 39 3 000 gross tons making a total gain of 14 249 000 grass tons. The act loss therefore to the Albes and nentrals was 969 000 tons

The figures for the gross losses to individual nations frough enough enough ston are very impressive. Out of a total for the Albies and neutrals of 1.2815 000 tons for all Bittain lost 7.75.74 figures tons. Norway, 1.178.15.5 tons. Franc. 907.108 tons. Itals. 852.124. tons and the United State 81.698 tons the percentages warsing from 46.8 per cent for Great. Britain to 7.2 per cent for the United State of the State of

During the war Great Britain built and acquired auffactors formage to reduce her net less to 3443,000 tons and during the same period we increased dur shipping to the extent of 1370,808 tons. As the result of his survey of the British pacies, Mr. Burley resolved the emissions that under favorable conditions the British may reach or evem accord the \$,000,000 gross tons output producted for 1919. Micrower, in found that France, Japan and Rally have asabilitims programs of construction for the British of the British

I maily it is Mr. Hinter a count is not that if the natural and describle reparation of the for just rate of the United States is to take place, three conditions must be fulfilled States is to take place, three conditions must be fulfilled First to distribute American justifiert and bring in imports through American age is en and largely in imports through American age is en and largely in terporation of the place of

# The Humanity of Poison Gas

To view of the feelings with which (ivilianton received the news of the first point on a state), in which horror and indignation contended for the mastery, there is, at its first announcement, something remie in the statement of our initiary men that poison gos is today a more humane form of attack than higherplower shell. But learn has positionally one of the German horror at the Vpre salient we hasten to add that the humanity of posion gas warfare is not due to the Germans, but to the ingranty of the Allies in providing effective gas-mask and developing suitable undired and hygenic treatment for those who have been gassed. Germany intended the posson gas to be just as horrible in its effects, just as citief and excremance in the ingering deaths imposed at it proved to be

So greatly have the borrows of gas attack been mitgated as more its first introduction, that in the opinion of Braggen Amos A. Fries, who was in command of the Chemical Warfare between of our arms at the front it is posseble that gas warfare may come to be recognized as a lawful method of warfare and that it will not be eliminated. The argument as presented by him is also ondiorsed by Colonel Walker, who is in command of the Edgewood plant for the manufacture of gas, of which we give a desemption obsorber in this issue.

The question of the "humanity of gas warfare is of course closely test up with that of the preparedness of of the war, course closely test up with that of the preparedness of of the war, country for general blude have aboven that are the casualties and permanent impures due to gas strate, the casualties and permanent impures due to gas strate, are far less than those suffered from shrapnel and high are far less than those suffered from shrapnel and high 100 examilies of all kinds suffered by our troops in battle, 100 casualties of all kinds suffered by our troops in battle, 100 per cent were caused by high typlosive shelf, shrapnel bullets, etc., and 30 per cent were due to gas, the gas of course. Some thrown in abelle first of from standard guine

But it a whon we come to the matter of the percentage of deaths to cantaltate, that x denover the surpraning fact that the deaths from gas were only five per cent of the total deaths, or to put it in another way, out of very 100 casualties due to gas three to four dash whereas out of every 100 wounded with high explosive, bullets shrappel, sets, twents to twenty-five dead, and among the deaths from gas are included these from pneumonia and other lung complications due to the patients having hom gassed.

Another accoulled humanitarian feature of gas warfare is the fact that whereas there are 3,000 men of our expeditionary fores who have lost either an arm or a leg from shell and rifle fire and a considerable number who have lost their aight, got a single man of our troops has been pormanently blighted by gas

As pointed out by Col William H Walker, who is better known to our readers as the Director of the Institute Course in Chamical Engineering at the Massasetts Institute of Technology, gas warfare to effective, largely because the troops that are subjected to centure expount to gas and, therefore, have to wear thair masks for several hours, love a great deal of their efficiency, went to the extent of rendering it ascessary to censore them from the gassed areas. It was the heavy gassing of the back carea, and particularly of the receive troops back of the British front lines, resulting in loss of efficiency among those troops due to their having to wear gas masks, that contributed so largely to the German success in the great drive of March, 1918. And the slowing up of that offensive and its ultimate loss of driving power were

due largely to the fact that the Germans ran out of gas If these facts are well established, and they rest upon the highest authority, it becomes a question whether a prudence and fareaghtedness do not suggest the maintenance of our great gas factory at Edgewood Aresual as a permanent mullitary asset of the country If a small and there, we should have at hand capable of mimediate to operation, a military asset far exceeding in its potential time anything of the kind on the world today.

# England to France by Rail

T was mevitable that the close of the war would see a revival of the discussion of the proposed tunnel under the English (hannel, but there is this difference between the project in pre-war and post war days-that today it has behind it all the driving force derived from the urgent need for such a tunnel that has been revealed during the 414 years of the great war League of Nations or no League of Nations, it is accepted on both sides of the Channel that the construction of the tunnel would greatly strengthen the alliance between the French and British nations though the cross-channel service maintained by the British navy during the war was a magnificent feat of transportation, the existence of a double-track rail connection would not only have vastly facilitated the flow of troops and stores from Great Britain to France, but it would have saved enormous sums of money and much valuable time

In all the years through which the agitation has been carried on, more or less intermittently, for the construcson of this work, the scheme was handicapped, fatally handicapped, by the reluctance of the British people to permit the construction of a work which they feared would destroy their absolutely insular position The objection was largely a sentimental one, and it has been completely obliterated by the bonds of good feeling that have been forged by the war Furthermore, the idea that the tunnel would expose Great Britain to military invasion was largely a myth, for it would be a very simple matter in these days of high explosives and hubly developed fuses and electru connections, to flood the lower reaches of the tunnel at a moment s notice, or indeed to blow it up altogether

It has been urged that a surpruse landing might be made at the terminal of the tunnel and its supproaches saized and held for the passage of troops. But that would be possible only in the sevent of the prosests negligence on the part of the military authorities. Furthermore, it would be a maple matter to establish several secret stations along the occast and misand, at which the throw of a switch would mean the instant flooding of the tunnel

In these days of ambitious sugmeering works, it is conceivable in this connection, that the Channel tunnel might be followed by one, only a few miles greater in length, extending from the Scottah coast to the Irish coast near Belfast Add to this a port of call on the wort coast of Irishad, and the time and distance consumed in a trip from Americs to Europe would be very greatly reduced.

### Heat Treatment as a New Specialty

THERE was recently organized in Cheengo society whose object is to promote the arts and element of which the process of the company of the co

### Aeronautical

Gothas for Great Britain .-- As soon as the circumstances permit, three of the German airplanes of each rendered under the terms of the armistice will be flown to England for exhibition purposes. The number of airplanes required from Germany is far from having been reached. In many cases the machines were found damaged or deficient in instruments or parts. On the British sector the proportion of large bombing plane only about 20-left by the Germans is very small. The examination of all the planes surrendered has added to the accumulated evidence that in armamout, fittings, and accessories of all kinds British aviation had completely outstripped the German air service. The total er of airplanes collected by the British Air Service is just over 500. About 170 were abandoned in open railway trucks and were left dismantled -- a clear evasion of the armistice terms, and evidence of the hostile spirit in which Germany submits to the inevitable

Britain's Monster Dirigibles.—An audine of the arbship program which the British Administy are reported to have in hand indicates that the giant airships, with a gas espacity of 2,000,000 cubic feet, a lifting capacity of 60 tnns, a range of 8,000 miles, and a speed of 6.70 miles as hour, will be expabled of remaining in the air for a week. They have a crew of 25. Still larger sinkips are projected, and passenger flights are pro-

sed for the near future. The first of those airships will be ready for hunching toward the and of the year. The present record for a British airship, non-rigid, is 1,420 miles, cruised by a North Sea airship in the course of ordinary escort duty. It was in the air for two days and manned by a crew of 15. The size of these airships are comparatively small Airships now being laid are nearly seven times as large. A number of these will probably be used for the government in reperimental postal and passenger-carrying services during the coming number. A regular airship mail service to America, thuring the summer of next year, is regarded as certain by airship builders.

Big Naval Plane for Transatiantic Flight,-There is now being rushed to completion in the Naval Factory at Philadelphia, Pa., what will no doubt be the largest airplane ever constructed in the United States. From such details as have been permitted to reach the press. it is understood that the machine will be merely an enlargement of the present Naval flying boats. It will be known as the Model T. The upper wing span will be 250 feet, which is 124 feet more than the N.C.1 the largest American plane to date. The lower wing will be 25 feet less. The length of the craft over all will be 80 feet, while the wings will be 12 feet broad and 14 feet The Model T will earry five Liberty motors of 400 horse-power each, three being tractors and two pushers. This power equipment is similar to that of Lieutenant Porte's British triplane, which is equipped with Rolls-Royce engines instead of Libertys. It is will seadily carry 75 predicted that the new machine will readily carry 75 passengers, making ample allowance for sufficient fuel all and such other supplies as may be needed for a 2,000-mile flight.

Aerial Goods Service Between England and Beigium .- The Daily Telegraph of February 3d last reports that an aerial freight service is contemplated between Folkestone, England, and Ghent, Belgium. English manufacturers have been finding it next to impossible to ship goods to Belgium by ordinary trans port, owing to the congestion of the docks in that country, and the Aircraft Transport and Travel Company was quick to realise the opportunity thus offered to demonstrate the possibilities of aircraft for commercial purposes. The company has entered into negotiations with British manufacturers interested in the forwarding of goods to Belgium by air The governments of Great Britain and Belgium have been approached in the matter, and the Belgian government has already issued the special certificates necessary for this form of transport. The British Air Ministry has given its consent also to the main scheme proposed by the Aircraft Transport and Travel Company, but stipulated that pilots of the Royal Air Force shall under-take all the aerial trips made. The load carried will be about two tone of foodstuffs, clothing, and other necessities. The extension of this service to Antwerp and Brussels is planned.

### Astronomy

Mount Wilson Observatory No Longer "Solar."—
On account of the continually increasing importance of stellar observations in its program of research, Mount Wilson Observatory has dropped the word "Solar" from its name. This step is particularly appropriate since the observatory acquired the world's must powerful telescope, which will add greatly to the number and range of night observations.

Distances of Cepheld Variables.—Determination of the shability emgetitudes and parallars by the use of the "luminosity-period curve" of 130 Cepheid variables have recently been made by 'shaptey From these measurements it appears that the distances of Cepheid variables are considerably greater than lave been obtained heretofore for individual stars. Less than one-thard of them have parallaxes greater than a thousandth of a second. The most distant Cepheda now known are meanly 20,000 light-years from the sun; almost as far away as the nearest of the globular clusters (about 21,000 light-years).

Statistics of Globular Clusters.—according to Mr. Harlow Shapley, the total number of known globular clusters is 69. Their distances from our system range from 6,500 to 67,000 parsecs, the most distant being N. G. C. 7006. The brightest stars in the most remote clusters are fainter than the 17th photographic magnitude. As to the distribution of such clusters is space, the most remarkable fact is their absence from the distribution of such clusters is space, the most remarkable fact is their absence from the distribution of such clusters in space, the most remarkable fact is their absence from the masses of a typical globular cluster is conservatively estimated to be from a quarter to half of a million times the solar mass.

A Star Occulted by the Martian Atmosphere—
an observation of extraordinary interest is reported to
the British Astronomical Association by Dr. C. Moreton
Bloom, of Porbes, N. S. W. On April 11th, 1918, he
observed with his 41-jach refractor the occultation of the
star 1524 Cape Catalogus (1990) by Mars — The unique
feature of the phenomenon was that the star did not at
any time pass behind the data for the planet itself, but
skirted it as closely that for five mutures the atmosphere
of Mars was interposed between the star and the observer. —Throughout the star's tragential course,"
say Dr. Okon, "its solor padel down gradually from
brilliance to a very faint salum tust, at the same time
its disk enhanced in size and softened down to a blurred
woolly image, as though overmagnified, or as a small
object would appear out of focus."

The Total Solar Eclipse of May 29th, 1919, the path of which crosses South America and Africa, will be observed by two British expeditions sent out by the Joint Permanent Eclipse Committee of the Royal and Royal Astronomical Societies Messrs Crommelin and Davidson, of Greenwich Observatory, will occupy a station at Sobral, state of Ceara Brazil, while Professor Eddington and Mr. Cottingham will observe on the Portuguese island of Principe, 110 miles from the coast of Africa. This eclipse will be notable, not only on account of the long period of totality (6 minutes, 50 reonds in mid-Atlantic and more than five minutes at the land stations), but also because of the location of the sun in a rich field of stars (the Hyades), offering a favorable opportunity for testing Einstein's theory of relativity, according to which rays coming from stars close to the sun's limb should undergo a certain deflection. A smaller deflection should also be produced by the sun gravitation, according to current ideas concerning th nature of light. It is hoped that photographs of stars close to the sun during the cclipse, compared with photographs of the same stars in the night sky, will show whether these theoretical deflections occur. The British observers propose to concentrate their attention on the problem of getting accurate photographs with this particular object in view, and will omit the ordinary investigations of eclipse expeditions Dr. Crommein, who sets forth the plans of the expeditions in Nature (Feb. 6th, 1919), calls attention to a rather serious error in the maps of the eclipse published in the ephemendes. They indicate that the track of totality lies south of the Liberian coast: but totality will in fact, be observable on that coast and under particularly favorable astronomical conditions, weather permitting. Unfortunately the climatic statistics for the Liberian coast are not ncouraging.

### Automobile

Capitalizing Racing Experience.—One of the veterans of the automobile receivards as expensive by going into the manufacture of untermobile tires. The racing man states that be found it necessary to make a special study of tree in order to accord as a racer—in fact, he made it even stronger, declaring that knowledge of tree saved lain from many accidents. The new tree, which is already being manufactured and sold, incorporates many quintos that have been dietated by the expenses of racing, which bringing out weaknesses and structural and other defects in tirre in an amanially whort indicage.

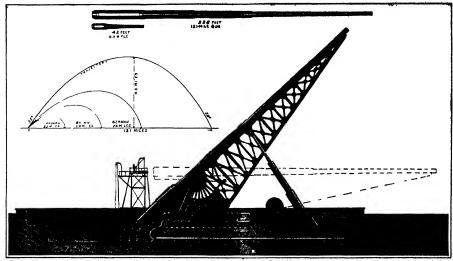
Plans \$259 Automobile.—Again an attempt is to be made, according to wall founded reports, to unanifacture made, according to wall founded reports, to unanifacture and market a small ear to sell at considerably less than the prize of any automobile move available. A unanufacture whose name is known the world over in conscion with low-prized machines as said to have designed a little car and to have expressed his intention of corming stillerally expetisated company to build it. Thou selling price is tentatively placed at something between \$250 and \$450. Itighly standardized quantity production includes a composite of the proposed automobile.

Cheap Care for Europe.—A French company has been formed to build low-prierd care in huge quantities in order to provide for the European market a car that will be the European equivalent of a well-known Ameriean car that a finding a large market abroad. It is said that the car, samples of which have been exhibited to interested parties, is built with European operating conditions in view and equipped with a body that suits European, and especially French, tastes. The engine is small and runs at high speed, having four cylinders 2.8.34 inches The care as whole is said to be lighter in weight than the American machine it is intended to commete with.

Activity in Automobile Invention.—For obvious reasons there was little activity during the war in the development of new ideas in automobile design and construction. Now, however, the art is full of more or less substantial reports of new things that have long been simmering without an apportunity to cume to the boiling point. Among the developments looked for are electric transmissions, kerosene and heavy oil cugines, new ideas in the use of aluminum, true that are puncture-proof and still resilient, simplified lignition systems, etc. As might be expected, the twere-quie engine is asid to be absorbing a good deal of attention, and several and obegins are to be ready in time for noxt vera's automobile

Electrics In South Africa.—It is an ill wind that blows nobody any good, and the ill wind of gasoline shortage has blown business in the direction of the makers of electric automobiles in South Afrea. Electricity is quite reasonable in price, and the generating stations in the larger cities, such as 'Cup Town, Johannesburg, Durban and East Landon, are making special efforts and offering special rates to encourage the use of electrons. The post office in Johannesburg is using 10 trucks in the handling of mail matter with satisfactory results. Here-tofore the derand for electrics has been rather small, but the now conditions that have arisen are invening up the business, the supply will be increased, and it is predicted, the prices will be lowered accordingly.

Stimulating Automobile Buying.—Automobile dealers have noted with considerable uncasiness a tendency on the part of the car buying public to hesitate about placing their orders, fearing that if they do so and pay current prices, there will later on be price reductions; purchasers then would be losers to the extent of the difference between the old and the new prices. The situation has been brought about by the falling of prices following the armstire and the easing up of conditions affecting the materials markets and automobile manufacturing generally. One of the most prominent manufacturers of automobiles and trucks has put into effect a plan intended to counteract reluctance to buy. If a car is purchased and at any time during the current year the price of that model is reduced, the purchaser will be refunded the difference, so that he will be in the same position as one who originally purchases at the lower price



Because of its great kineth the gun 4 lid not be earlied on trumbions. Int would have to be mounted a truss. Our and truss would be availed and depressed by adopting the barpine because of gun 225 ft weight of 250 mas. Weight of power 1 to penned Manale valence; 8 800 flow-seconds. Depun gun was designed bus 1 Theoretical study of a 10-land; gun with a range of 121.3 malice

# A 121-Mile Gun

# Ordnance Officers of the United States Army Demonstrate Futility of Super-Range Guns

# By J. Bernard Walker

LONG before the Germans began to throw shells into Paris from a distance of 75 index it was well understood among ordinance officers that such a feat, if any one should care to attempt it was perfectly possible The introdu tion of slow lurning perforated powder and the great improvements in gun steel opened up and the great improvements in gun steel opened up large possibilities of inversasing the range of artillery and the ranges for heavy guns both insval and military, quickly ran up to 15 20 2 and even to 50 miles Because military inen in considering what range to give to their wapons a laways think in terms of military

objectives of limited area such as gun pits crossroads ammunition dumps airdroines, etc. for the actual hitting of which observation from an elevated position or by airplane is necessary no one had thought of building guns to throw shells to such distances as would prevent observation of their point of fall and it took the German onservation of their point of all and it took the German mind in its gradual assent or rather describe morpouson gas to submarine piracy to conceive the its of building a gun that could throw shells in a haphazard fashi in into the city of Paris a target so large that even from a distance of 75 miles it would be impossible to miss its most important centers. The Germans knew that the small size of the shell 8.2 inches and the lack of ob-servation would render the innternal damage done out of servation would remut the insularial damage done out of all proportion to the cost in time mone; and trouble of building and operating a 75 mile gun such as they planned. It was not material but moral damage that the Cormans aimed at and in this as in so many other cases of terrorism on their part. They failed ignorimmously

The Allies built no super range guns during the war-not because they were unable but because they had no wish to 1 bey realized when it came to a question of with to 1 by redird 1 when it came to a question of retaliation for carman bombing and shelling of fortisted etices, that the airplane is infinitely more efficient than the super rang gain that for the cost of one shell dropped upon a city by the gain over one thousand times as much high explosive could be dropped from bombing airplanes and let fall with greater accuracy. It was in order to prove how stravagant in time cost.

and labor is a super range gun in proportion to the damage it can do, that the Ordnance Depunt of the army designed a 10-inch gin which was to have a range of between 120 and 120 and inch with a view to getting Time of first

accurate data on such a gun, its design was proceeded with exactly as though it was to f rm the basis of working drawings and specifications (or construction at the gun factory The results of this investigation are shown

gun factory. The results of this investigation are shown in the surprising sketches and tibulated data of this gun which, by the ocurtery of the Army Ordanaco Deptint, we are permitted to make public. It should be understood, just here that the dimensions of the gun weight of powder slid gun etc. and the general hallistic data are ther. It is of closs calculation. The method of mounting the gut as shown in the accompanying sketch is merely suggestive and was never worked out in any detail Broadly stated the problem is one of burning a sufficient amount of powder in a gun of sufficient length to maintain a m in pressure down the bore of the gun sufficient to proline at the mussle, the enormously high velocity necessary to carry the shell for a distance of 125 miles. With a 10-inch shell of 400 enormously high vestority necessary to tarry one same tor a distance of 125 miles With a 10-inch shell of 400 pounds weight, and a chamber pressure of 22½ tons to the square inch and a muzzl velority of 8,500 foet per second it was found that the ingle of departure which

COMPARISON OF A 121 MILE CIN WITH A GIN OF

|                                               |                    | T                     |
|-----------------------------------------------|--------------------|-----------------------|
|                                               | Plawick            | 1 heoretical          |
|                                               | Standard (         | Super Runge Gun       |
| ( shi er ol gun                               | 10 inches          | 10 Inches             |
| length of gun                                 | -43 feet           | 225 feet              |
| Weight of gun                                 | 38 top-            | 325 tous              |
| Wought of properties                          | 600 pounds         | 400 pounds            |
| Weight f powder<br>charge<br>Pr w ler chamber | 200 poun is        | 1 440 pounds          |
| pressure                                      | 40 000 lbe person  | 45 000 lbs per sq in. |
| M ustle velo its                              | 3,000 foot-ser nds | 8 500 foot-seconds    |
| Mussle energy                                 | \$1 000 foot t na  | 201 500 foot-tons     |
| Maximum range                                 | 25 miles           | 121 3 miles           |
| Angle of departure                            | 45 degrees         | 55 degrees            |
| Angl ffall                                    | AD degrees         | 59 degrees            |
| Summit [ trajectory                           | 7 S miles          | 46 miles              |
| Vel sety at summat                            | 1 550 foot-seconds | 2 600 foot-seconds    |
| Terminal velocity                             | 1 505 foos-seconds | 2 750 foot-seconds    |
| Time of flight                                | 1 min 37 seco      | 4 min C nece          |

gave the best results was 55 degrees and that under these conditions the maximum range would be 121 3 miles

An interesting fact brought out by the investigation An interesting fact brought out by the investigation was the determination that an angle greater than 45 degrees would give the greatest range. In previous years with gues of extreme ranges up to 21 miles where the line of flight lay entirely in the lower and dones strate of the atmosphere, it was found that 43½ to 45 degrees but in these of the atmosphere, it was found that 43½ to 30 degrees was the correct angle for maximum range, but in these super-range guns, where the shell quickly passes into the higher rarified atmosphere, it was found that there as a positive gain in increasing the sagie of departure, for the reason that at 55 degrees the shell follows a shorter

the reason that at 55 degrees the shell follows a shorter path through the denser atmosphere, say in the first 10 miles than it does at 45 degrees, and hence it emerges into the upper atmosphere with a higher remaining velocity. The dimensions of the gun are certainly very startling. Particularly in comparison with a standard Elsevick 10-inch gun Its length is 223 feet as against 43 feet, the provider charge goes up from 200 pounds to 1,440 pounds, the provider pressure goes up from 200 pounds, the provider pressure goes up from 200 pounds and the standard gun is 3 000 feet per second, in the super-range gun is 8 500 feet per second, and although the shell is the standard gun in 25 per cent heavier, or 300 pounds the extended gun in 25 per cent heavier, or 300 pounds the shell is the standard gun is 25 per cent heavier, or 300 pounds as against 400 pounds, the mussle energy, which is 31,000 foot-tons in the standard gun, is 201,500 foot-tons

and not to the control of the contro

miles, and here it still has a remaining valcerty of 2,500 test per accord. Then, as a commences to fall, gravity egins to act in its favor and probably more than counter-acts the resistance of the tenuous atmosphere, with see again until it gets within ten or twelve miles of the earth, when retarda-tion again takes place, the dual arriving velocity being 2,750 feet per second and the angle of fall being 59 lagrees, which is four degrees

The elapsed time of flight would be 4 mins 9 seconds Since the total length of he gun would be 225 feet, it would have to be built in, parts screwed together This is perfectly feasible in fact,

makers have used the method in some of their guns with complete success. The weight of the piece would be 325 tons and this, coupled with the energy of a recoil corresponding to a muscle energy of the shell of over 200,000 foot-tons, would call for some very original and clever engineering construction in the mounting of the gun Because of its great length and weight it would gun Decknise in the great or engight and weight it would be impossible to mount the pace on trunnons located at its center of gravity, for the gun, being elastic, would bend under its own weight and, when fired it would have a volent whipping action. So it would have to

nave a violent winping section so it would have be carried on a trues, or rather, on the apex of a triangle consisting of three trueses—two side trueses and one connecting the bottom chords of the side trueses Elevation and depression of the gun would be accom-plished by forming the bottom chord of the trusses towards the breach of the gun mto two broad curved and toothed bearing surfaces, by means of which the gun and its carriage would roll upon a sutable founda-tion path in such the same manner as a basoule bridge. The gun truss with its into two broad curved and toothed bearing bascule bridge. The gun truss with its counterweighting would probably be found to weigh at least twice as much as the gun or, any, 650 tons so that a very massive mount and powerful means of checking the recool would be necessary. The gun carriage platform would have to be mounted upon several parallel tracks to listitute the weight, and in addition to adding friction through blocking inter-owed between the under-side of the arriage and the rails, additional retarda-ion could be provided by means of sicel ables, anchored to the forward face of

he gun pit, and leading back to winches ne gun pir, and leading back to winders in the gun platform, controlled by powerful friction orakes. The elevation and depression of the gun might be controlled by a telescoping hydraulic plunger, as

ndicated in our drawing

The thanks of the SCIENTIFIC AMERICAN are due to the Army Ordnance Department for the opportunity to present this very interesting theoretical study of the possibilities of long-range artillery. The results most dramatically prove the futility of building such ordinance The results most A single gun, as pointed out to us by the ordnance officer at Washington, who made the calculations for officer omer at Washington, who made the calculations for this gun, would cost probably about \$2,500,000. The best it could do would be to land a 400-pound thell, containing about 60 pounds of high explosive on a target 1218 miles away,

whereas a bombing plane, costing about \$36,000 would iand a 1,800-pound bomb on the same point with greater securacy of sim.

# Operating Room That lies to the Battlefield By F. Honoré

HERE is nothing new m winged ambidances, which



Airplane view showing flight of 10-inch shell from Aberdeen to Perth Amboy

loss of time But there is distil a novelty in the winged rating room or surgical was I which flies to the battle field and performs its work wit re its patents have fallen
Especially in cases of severely wanted soldiers where operations must be imme but is performed if a life is to be saved as the surger if a plane indespensable.

It has remained for a Freu i d et r Vilmant and a

Russian sugmest, Nemisovsky to introduce the surgical russian digineer, Neminovak to introduce the digital aurplana or winged operating r in whi is fine to the battlefield where severely will illimit ar in need of surgical aid, with its staff of any main resistants and complete equipment. The wiget operating room or

1.600

Near view of the Voisin surgical plane showing the stream-lined compartments for carrying the comparent

surgical airplane, the first example of which was officially surficial surplane, the first example of which was officially tested at Pars on March 3d last is of the hiphane type and generally a slaghtly altered bombing plate a such as the Voisin The first mechanic of this type has a useful load capacity of 720 kidos (18.0 pounds) which is usualized for the policy, surgeon the assistant surgeon a complete X-ray equipment and a complete set of surge in instruments and a decessories ministing as combined on the property of the property natruments and accessories inclining a combined X-ray and operating table, sterlining outfit instrument cabinets, medicine chests and so on. Current for its X-ray apparatus is supplied by a storage battery which charged while the bipliane is under way by means of the



what sirplane that curries a surgeen and maketant, and complete operating room equipment here shown

Needlan to state all the quipment has been designed with a view to conomizing weight and space. Aluminum has been used to a great extent is can well be imagned. Many of the ımagıı ed pa es l'equipment can be more or less completely dis initil In the close up let tithat the equipment is cirii l ii long streambid biles unleneath the wirgs and to citler side of the macche as well as in the necello.

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At present M Nemisovsky is engaged in constructing a still larger surgical air plane which is destined to serve as an operating room on the battlefield as well as a means for transporting the wounded This machine will carry seven or eight surgeons

and assistants with their equipment who will be installed at some convenient point on the battlefield. The sirplane will then be avail able for transporting the less scriously wounded soldiers to the base hespital

# Some Applications of Electroplating

ELICTROPLATING is an art which has been developed during the last 50 years with only occasional applications of scientific principles. Formerly the such application of stratch principles Formerly the industry was much shrouded in inystery each plater guarding jeak usly the formulas and in theils employed by him Of 1 cut years however there has been insidered k d mand from electroplaters

and manufacturers for more exact data relating to this industry

This need and demand for information has I cen emphasized during the war by the numerous problems that have arisen in connection with the plating of military supplies of the most varied description Il us zure plating has furnished an excel lent and in many cases the best protection as airplane and scaplane littings, fuse agunst the corresion of swel parts such parts hardware on ammunition boxes etc. Black nickel plating was very ex tensively used for producing the so-called government bronze finish upon braze pardware and saddlery equipment Lead plating proved valuable in the hining of gas shells and for bringing up to standard weight shells which were underweight. In connection with these problems a number of investigations were conducted at the Bureau of Standards whose experts made frequent visits to munitions plants to ad

the desired results Appropriations have been requested by the Depart ment of ( ommerce to permit more exhaustive study by the Bureau of Standards of plating problems and their application to various manufacturing industries Lieotroplating forms an excellent illustration of a 'key industry , t e, an industry which while it is not itself of great magnitude, is often of fundamental importance to larger industries. Thus electroplating is essential to the manufacture of tools huilders and saddlery hard ware plumbers supplies gas and electrical appliances automobiles silverware jewelry stoves household utensils mechanical devices su has phonographs cash

registers sowing machines adding machines typewriter cameras and other optical and scientific instruments and in fact almost every industry in which finished industry in which finished metal articles of any description are produced in the art of electroplating will bring about corre ing improvements in all such industries

Arrangements have been made by the Bureau of Standards to secure, by in quiries addressed to the platers of this country reliable information regarding kinds and methods of plating now in commircial use

# England's Aircraft Industry

A Glimpse of Hei Tremendous Achievement from Small Beginnings

By (. II Claudy Special Correspondent of the SCIENTIFIC AMERICAN, Now in London

WILLS the war studed Great Britain 8 at O on W places to Irin None kn with a what an plan s were to be in the war still less that if y were to be the deciling fate. At the section franction decided about 140 machines with our lattle year impanied. a much luger ain vithor () of Britin vitest 150 000 expelite mary by
When the Unite Pstates are into the wealwepromise t

rather to crashly training sent 20,000 planes perhaps may in but certainly within two your

may a but certainly within two y or. We diluted to C. et Brita, in all a promises but what she lid though up are it. It the known is far more than we promise It. I.
At the beginning Irll was Creat Britain s, separaty for

minufacturing anglin's was not greater than 100 per year. At it tene it accustice was signed she was turning air planes at the rate of 800 a week! In other words har production possibilities were demonstrated to words by perfection posseturities were demonstrated to be near see of 40,000 planes a year! Illink of that and remember that it is not America with his limitless resources for a rul money and factory and ruc material but the British lakes with their very much matter and the state of the sta get the actual facts take off year leat and low in deep respect to a nation we of America are rather too apt to consider slow and old fashioned in methods when it

Course to factory production

Nor that for a mannet. Oh well after all they were only British planes and enguies. The only doesn't ability minerarchity steadness and stirringes the British planes led those even of I rance home of aviation As for Cormany's much vaunted planes while it is freely admitted that it was Cormany which first armed a plane with a rapid fire gun shooting through the propeller a more which gave the Allies scrious trouble in 1915 her craft as craft were never in the same class with the British lighters only history and the perspective of years will tell how much of the war was went in the but all the facts of both quantity production and ability to stand up under gruelling work are on the sid of the British machine

It is dilbeult to give an idea of the seze of the industry as it is ligures mean so little to the average reader and et hguns and only hguns can tell the story adequately In 1914 there were six factories in Fugland turning out There were 126 firms under contract for planes besides three huge royal arrests factories at work here when the armstee was signed. And they produced

In the year 1918 and please recall that the armistice was signed on the 11th of November I ngland turned out no less than 40 849 airplanes of all types. And they were all cagned not it is true all by home manu-facture but they were all engined—indeed the available engines exceeded the planes there having been 31 021 engines available from all sources!

Lest some one with a vivid (magination and an intense patriotism imagine that the Liberty motor played any ery important part in this engineng campaign let it b stated that liberty motor deliverees to lingland a mmenced in May that the promises ran from 20 in May to 100 in lunc 200 in July 400 in August 500 in September 315 in October and 316 in November while deliveres commenced with 14 in May and then rue 50 125 336 92 130 and a final delivery of 132 in December In other words we promised 1851 by November and delivered 1255 by December

universal 1250 by December.

And this was one engine in very fine engine an engine
given the highest graine in I ngland both for its perform
ance and for the inserved of its having been designed and
put into production so soon and so rapidly. But if England cuted to she could in the considerable fass about er owe ability to produce engines! It must never be forgotten that I ngland did not recognize any more than did the rest of the world that the war was to be largely won in the ner until the war was well along into its four years of life. By the time she was ready to realize that there must be planes and planes and still more planes. years of his and that planes meant engines and that engines first of all steel, the manitions industry had stepped in and grabbed most of the available steel and had it all promised for other things Yet at this point Great Britain developed a new steel industry to feed her engine factories, and was neaking more than she needed when the armistice ended the necessity

The total number of airplane eigines delivered by Bultish contractors during 1918 was 21,950 Libra number includes 23 different varieties made in quanti-ties ranging from eight to 4,064. It is not necessary to ocation than all but it is interesting to see them divided into classes. Of two typs of vertical engines 5370 were made. Of the V-typ in doss there were 12 makes produced to the tune of 0.011. Iwo makes of radial ugues—sumilar in appear in t rotaries but with the cylinders stationary—were mil in quantities ag-

greating 16 Finally there were 56 greating 16 greating 16 Finally there were 56 greating to follow the nation of rotary engine 11 is interesting to follow the nation of reagances in the light of history 1 lanuary the total production of all makes was 1661 1 chruary awn 1428 manufactured and March 1741 16 March was the great German offensive, it will be r membered and of course all production was speeded | But it takes time to speed up production of engines | 50 April saw 1 667, May 2 039 June 1 760 and July 1 881 In August they drew hreath and turned out only 1 -8 but by September and October production was gork on like lightning 2 387 and 2 845 engines coming feeth ready to fight the Bun Thou cam November at I the armistics and production dropped to 1,615, follow his December with

The production of planes of mrse exceeded the production of engines Particulus is due to the sensiting of planes which does not always smash the engine and partly to the feet that it is easier to make a plane than an engine battleplanes per haps excepted. But there were always enough engines when the foreign sources were added in with the local

It must not be forgotten that there are two sides to the air Science and that the naval scie was of very great importance. Thus there were made during 1918 in addition to the 30 000 odd aircraft already mentioned no less than 1 407 seaplanes, which number includes flying boats. Not until the British Admiralty chooses to unlock its lips will the story of Britain's navy in the air be known but it is a strange story judging from the straws which stick out here and there one worth telling and

worth hearing

A little sidelight on aviation in general is thrown by he propeller statistics England produced in 1918 no less than 80,446 propellers, which is very starly three propellers for each plane! This hight by the way, is for 11 months only. December statistics not being available Evidentity the mortality among propellers is no less on this side of the Atlantic than in the United States. The largest month was October with 11 123 propellersnearly 400 daily

Some factory statistics may make the picture a little clearer. In one shop, for instance where Handley Page machines are made—the great big machines which carry so much weight, either in passing ris or in homis— there is employed an average of 1 000 people of whom there is employed an average of 1 one proper or woom 400 are women During Mav line July August, September and October of this year this particular factory put out 25, 23, 23 27 21 and 18 machines. It required 16 770 man-hours per or white in this shop, plus about 50 per cent to be add on account of work done on sub-contracts, to complete one of these huge

The smaller machines of course did not take nearly so long to complete A shop devot d to the manufacture of the familiar Sopwith Camel turned out 60 40, 34, 36 35 and 47 machines during the moi the mentioned There are employed here an average of 650 people, of whom are employed here an average of 1991 people, of whom from a third to a half are women. The man-hours re-quired for one of these machines is but 435, which is surely rishing it through—43 ten hour days for one man to make a planel

to make, a plane!

It may be micrestum; to note the size of such a factory. This particular Camel factory has devoted to mill work. SI 48 equars feet to jointers shop 2,7,21 equars feet to dope and fahres shops 9,048 equars feet and to the man erecture, shop 1,448 equars feet of space. In a contract factory devoted to making D II mues, there were turned out finished planes at the rate of 147, 145, 173, 49, 88 and 195 in the mouths from May to 0 to their inclinave. Here there were in the neighborhood of 2,000 men and half that number of women employed. The man-hours per maxime were 4536, to which some 15 per cent must be added for the contract work done in other shops to complete the plane. The size of this factory is shown in the floor space used, 9,450 square feet in the sawing

shop 57 000 square feet in the joinery shop and 150,000 square feet in the main erecting shops

Altogether Great Britain manufactured more than 50,000 planes in 1916, 1917 and 1918 Had the war continued much longer, she might have rivaled our own Liberty in engine production as the big Napier Lion was just coming into production. It is a 12-cylinder, was just coming into production. It is a 12-symmer, 2150-revolution-per minute engine with ideavolps about 480 horse-power. In this connection it is interesting at 50 more than it is not note the universal experience here as between the production engine and the hand-made engine. There is no question but that the production engine can be made so that the total output vasily outdoes the life of the total content of the hand-made engine with this same grant-hours content of the hand-made engine with this same grant-hours. output of the hand-made engine with the same man-hours per engine But there is also no doubt that engine for per engine. But there is also no doubt that engine for engine the best production engine is inferior to the hand-made engine in lasting qualities, in an average ratio stated with diffidence by many who should know the exact figures, to be two to three life; is, if the life I hat is, if the life of the hand-made engine is 120 air-hours that of the pro-duction engine will be but 80 hours by much for the

theroughness and care of British machinists labor!
But when all is said and done there is no real exaltation in figures and no enthusiasm in statistics. Grant that more machines came from loss floor space and less man-hours here than anywhere else-which may or may not be the case - and what is there in the statement after all? The big picture is in the fact that with 66 planes going to France with the first expeditionary force, with a yearly capacity of 100 machines and those by no means recapacity of 100 machines and those by no means re-markable for speed power, endurance or dimbing ability Grest Britan has within three years, put her amplane midsarty in the front rank of those of the world, supplied herself and her allies, and our own troops very largely with planes produced, and precured engines enough to pull through the air the stupendous production of war, then 1000 chalms are seen to the stage of the second o of more than 10 000 plants yearly, and was going at the rate of over 40 000 planes yearly when the armistics

What six will do with her sirplane capacity only the What six will do with her arphane capacity only the future can show But for the present, both in planes existing—in figure which unfortunately cannot be had—and in plane-production power, Great Britain is as much mistress of the arr as she is mistress of the seas. And she did it all in less than three years

# Ships of "Puffed Brick"

THE world was skeptical when engineers announced as a win-th war measure that they would build sea-going concret ships. Who ever heard of a rock floating anyway? The same sort of talk confronted the man who made the locomotive. He was told the wheels would simply spin and that there would be no traction But the locomotive walked away with itself and its load.

But the locomotive walked away with itself and its load, just as the concerte ship floated as gracefully as a swan. But when the engineers tell us they are building a ship of puffed hork. 'they are arraying things, it would seem, to a foolish extreme.' Yet this is what manne engineers are doing out on the Pacific coast. Two puffed-brick ships are soon to be launched at San I ransesce. Brids layers are not however, employed in building this layers are not however, employed in building this layers are not however, employed in building peculiar type of boat, because with the mortar un

trowel-wielding laborer is not required

The puffed brick used is made, like ordinary brick, The putted brick' used is made, like ordinary brick, of a peculiar day containing a low percentage of silica Subjected to an intense heat, the brick puffs up like oppororn. The product looks something similar to coke and is about as light. Once pushed the bricks are ground to a dust and mixed with comment. This process, it is claumed, makes for a gun of about 40 per cent in the lightness of the ship's walls, without losing any of its highly walls, without losing any of its

strength

The ship's forms are built in standardized sections and are hinged with bolts so they can be forced up and put out of the way when the concrete hardens After launching, the forms are quickly put back into place, sited reinforcing rods installed, and the pouring of another ship can be begun

According to experts in concrete shipbuilding this system makes it possible to turn out a 7,500 ton-vessel every three months, and only about 25 per cent of the lumber in the forms is wasted The first two ships built of this material at San Francisco, coach 7,500-ton off tanks, are ready to be launched They resemble steal ships in their lines and are a big improvement over the tants, are reasy to be saunched. They resemble steet ships in their lines and are a big improvement over the "Fauth," the first concrete ship built. They are to be launched broadade to the water, as this method spreads the strain over a larger surface.

# The Chemical Foundation

# A Semi-Official Corporation that Will Hold the Fort Against German Reinvasion of Our Chemical Industries

WHEN the Ahen Property Custodian began taking this country, he found himself confronted by a curious situation. The Trading with the Enemy Act had not in the first place been so drawn as to make it possible for the Custodian to take over enemy owned patents and if he were to attempt the operation or the sale for operation of the sersed plants, he would be laying the founds tions for much future litigation and possible heavy damages to the owners of such patents. For in the eyes of the law one who uses a patent without the consent of the owner is an infringer, whatever the circum patents are not granted with the reservation that they become invalid in the event of the war

An amendment of November 4th to the Trading with An amendment of November 4th to the 'Irading with the Enemy Act was designed to remedy this defect in the original law Under its terms patents were in-cluded among the enemy property which might be sensed and held by the Custodian, and it at once became possible for him to operate patents himself and to liceuse ir operation by others, either exclusively or otherwise But on careful consideration of the matter. Mr Palmer. olding the office of Alien Property Custodian, decided that there was far more promise even than this

m the new situation

It seemed, in fact, that the suized patents might afford possible solution for the problem, theretofore unsolvable, of protesting the now American dye industry against German competition after the war. It was evident from the manner in which the German chemical concerns had done their business that they had no intention of manufacturing in this country and did not fear competition from American manufacturers, and that accordingly they could not have taken out American patents with any idea of preventing American competithese patents as protection against competition in the American market by other Furopean manufacturers If they were sufficient to stop importation of competing Swiss Trench and English dyes they would presumably swiss I relate an Languist very city would presumanly serve in American hatds to stop equally the importa-tion of German dyes. This was particularly probable in the case of the product patents since most of the coal tar dyestuffs are definite them at combinations to which a product patent is entirely applicable

The idea was accordingly conceived that if the Garman chemical patents could be placed in the hands of any American institution strong circugh to protect them a real obstacle might be opp sed to German importations after the war, and at the same time the American in dustry might be freed from the probabilition enforced by the patents against manufacture. So a corporation has been organized to be known as Chemical Loundation Ine in which practically every American manufacturer will be a stockholder, but in which the number of voting shares held by any one interest will be so restricted that improper control will be impossible. This I ound then will hold the German chemical patents some 4 500 in number which have already been transforred to it for a consideration of \$250,000. It will in no case operate any patent itself, it will narrly set as a holding and heening body Nonexchance houses only will be granted to all proper American applicants at a small fee, and to the United States without fee. All surplus income is to be used for the retirement of the preferred come is to be used for the rectinent of the preferred (non-voting) stock, and therefore for research work looking toward the advancement of chemical and allied science and industry. In this work the I condition will have the cooperation, and ab veall the use of the equipment of the Bureau of Standards and various other public and private research or mizations. The capitalization of the 1 modation is half a million

dollars of which \$100,000 is v ting common stock and the balance preferred stock. After paying for the patents transferred to it by the Alien Pricerty Custodian it will have \$250,000 working capital and it will accordingly be in a position to prosecute vig irously any infringement proceedings which may become in order when German manufacturers begin their attempts to regun their American market

The price paid for the patents which constitute the stock in trade of the new oncern was necessarily some what arbitray. The girlt majority of the patents presumably are valueless. Of the remainder the value was quite impossible to estimate. Substantially the entire American dye and medical dar lustrics having combined in the procurement of the spit of fit this under-taking it would have been impossible in public sale, to find as a bidder any legitimate manufacturer bid received would necessarily have been from speculators with intentions amounting to blackmail or actually acting in the interests of the former owners. So the sale of the patents was made privately and at the figure mentioned which represents merely somebody's guess as to what the patents are worth but which no matter hew wrong it may turn out to have been can injure no one but will serve as a basis from which the Loundation can begin operations

In a comprehensive report covering the matter of Ger-ian chemical patents. Mr Palmer the outgoing Alien Property Custodian explains very fully the manner in which Germany had secured her world monopoly in the chemical field the accessity for breaking that monopoly, and the official expectations that this I oundation will constitute a very potent means toward that end. In a later issue we shall present some of this interesting material to our readers for the present we have space been put into operation. The new institution promises an incalculable benefit not only to the dye and chemical industries, but to the whole American manufacturing world The opportunities which it can offer and the rewards which it can hold out to competent research scientists should far exceed those of any institution uncouncited with industry and it may well therefore, form the nucleus of the greatest research organisati in this country

# Correspondence

The editors are not responsible for statements made in the correspondence column Anonymous commu nications cannot be considered, but the names of cor-respondents will be withheld when so desired

# A New Plan for Daylight Saving

To the Editor of the SCIENTIFIC AMERICAN

The plan of setting the clock back one litter in order to save the daylight of summer takes advantage of part of the wasted daylight, but does not begun to be efficient in this respect. The sudden change of one hour in time a laways attended with confusion and discomfort. The following plan will utilize all of wasted daylight and will avoid confusion consequent on a sudden arbitrary change of one hour in the time

The difference in time between sunrise on the 22d of December and sunrise on the 22d of June is approx mately three hours or about thirty seconds a day beginning of the working day is now fixed with regard to the middle of the day In order to use the daylight hours effectively the time of sunrise should be the beginning of enectively the time of sunrise should be the fix mining of the day instead of the greatest mirridian height. Here fore a plan by which the beginning of the working day is changed automatically with the change of sunrise will afford the greatest efficiency in saving daylight. This can be accomplished in a very simple manner

The Western Union, through its electric clocks gives official time throughout the country. This official time could be easily changed during six months of the year by regulating these clocks to make them lose two seconds or more each hour or sixty seconds a day. The watches and clocks of the country can easily be adjusted to run thirty fast during the other six months Light o'clock seconds fast during the other six months. Eaght o clock is probably the most popular time the country over for beginning the day's work. The ideal surrise time would probably be seven colock, since when the sur rises at seven there is usually sufficient light for ordinary pursues. poses by 6 30 which would perhaps be early enough for the rising time of most of the people. This plan would, therefore, best be put in operation at the time when the sunrise is at seven o'dook which would be about the first of February. The people would then continue to rise with the coming of the light the year 'round and it would be done automatically. Having once adjusted time-

es people would not realize on the 22d of June that pieces people would not realize on the 220 or raine they were rising three hours carrier than they were accustomed to rise the year he for

On the 22d of June the time pieces would be reversed and the master clocks would gam 30 seconds a day for six months and without knowing it people would by the next February be rising three hours later

HALSPY W WILSON New York City

# A Camera for Filming Rapidly-Moving Objects

THE conventional motion picture camera is excellent enough for the regular run of tilin work focused by estimating the distant and then setting the lens according to a scale of for more accurate worl lens according to a scale of from accurate work the mage, can be focused by bold methods a perholos and on to the film, which acts in the same mainer as the ground gloss of the plate contra. And when it is necessary to follow a moving object the camera can be travered and tilted by means of two handles actuating the tripod head

However, the conventional camera has its limitations particularly in unusual film work such as may be en countered in screen reporting and trivel subjects fact while doing extensive s leath work in the jungles of Africa, Carl D. Akely of the staff of the New York Musium of Natural History from the insual type of motion-picture camera in id first and mischable for the varied uses of field work. Knowing the demand of the topical and scenic cuntrium he conceived to principle of the present cinera which bears his nan-Upon his return to the United States he designed in 1 executed the first working model which was deser > 1

an these columns almost three verus age.

And when the Signal Corps of the United States At my embarked on the gigantic task of filming out part in the war, the authorities settled their choice on the Akeley camera because it met their requirements better than any existing camera. The fact is that the Akeley camera any existing camera why it is available for special work which can hardly be undertaken with the average camera

Briefly, the Akeley camera is a one-man camera, in the sonse that its operator can carry the camera magazines some that its operator can carry the camera magazines and tripod himself, and set then up without assistance. The Akeley tripod is of the true design, with the members locking by means of cerentric clamps. The legs are placed in any convenient position, and pulled out to

any length desired whereupon they are immediately locked in position by pulling up the contrict claims.

The camera is thin lockled by means of the ball-andsocket joint and a spirit level. All in all, this tripod
mounting is absolutely rigid.

The tripod head in this instance does not call for the usual cranks for the panoramic and tilting movements. Instead the camera is controlled by a short lever which protraids at a 45 dayer upward angle from the rear of the case. By applying pressure on this lever the amera, can be moved betweenfully or vertically or both hom-zontally, and vertically at the same time. A steady movement to nesured by gents and flywheld and a re-heaming device permits the teamer to be questly moved of following an exceptionally fast object. The horizontal protrudes at a 45 degree upward angle from the roar of is a might write permits the camera to be quickly moved if following an exceptionally fast object. I he bornsontal panniamic inoverment permits of a complete circle while the virtues that allows of a 140-degice range pointing from the ground to directly overhead without changing that the range is made in the factor in the tipod. while still retaining the tripod lead and three point support for use on a table log rock or other surface.

I will leases are employed on the Akeley camera one

for the film and the other for the finder. This arrange-ment permits of watching the picture on the ground glass right side up while operating the camera. Again, eyepicce always remains in the desired position no matter how the camera may be tilted because of a double prism system of transmitting the image through the hinged tube. Thus the operator can always tell whether his meture is in tucus-indeed he sees exactly what the is recording at all times

The shatter of this comercias in the form of a continnous fabric helt containing a variable opening. This belt travels between the double walls of the camera case Its opening can be a limited for any size so as to vary the length of exposure in fact it is a focal plane shotter quite similar to those employed with reflectingtype cameras. The movement is also unique being of type cameras the movement is also inique occas or the single pin design. The magazines are made in one unit and are always ready with a short loop for insertion in the camera mechanism. This permits the camera to be reloaded and threaded in from 10 to 20

esimira to be revolucial shall intradice in from 10 to 20 seconds. Complete the camera weight 45 pounds. For filming rapidly moving objects, such as motor boats, nightness athlets, and so on, there can be no doubt that the Akeley camera is in a field by itself. And this is but logical since it was designed primarily for that purpose by a man in need of such equipment.

# Return of the 17-Year Locust

# What He Is and How to Combat His Ravages

By W. H. Ballou, Sc.D.

THE Department of Agriculture Washington warms A that this will be one of the worst scisons on record for manges by the Seventren Year locust. Government entomologists predict that the variety is due to swarm in large numbers

Somehow the idea is brouleast that the country is osited by this variety of locists only on c in 17 years this version has no application. The marct derives its common name merely because of the fact that it requires a full fledged boast 17 years to proture from the requires a run nough from the registrough the several stage. It is quite possible for the variety to be lusy an ewhere every ven. I note the following label at the month of plan of the insect at the American Mus num of Natural History. New

The 17 Year Cicida III is a september appears in the late May or early June of a locust year immature creates criwl at and second tree trunks of other vertical surfaces. If the granned is dry or bare they make a circular opening only if moist or covered with leaves a mud tower is built around the hole from which they emerged. These towers are frequently made by the immature creades several weeks before they are ready to knye the ground Within a few hours after reaching a suitable resting place the skin splits along the middle of the back and the adult emerges. Later,

recompense them for the long period of preparation. There are a score or more of different broods, each of which has a rather definite—often restricted—distribution and time of emergence from the ground. Suppose there are three such broads in your neighborhood. One of them the adults, may have apprived in 1911, its next appearance would be in 1928. Inorther might be 1916-1943, and so on, while a third might be 1916-1943. As a matter of fact, these are actual broad dates, although they may not be the ones in via meighborhood. Hence we may have 17-year locusts oftener than every 17 years, to say nothing of the possibility of lagards or extra spry individuals, in the various broads, which do not appear on achedule time of the property of this family I might be noted that the man Cu i to these of many rc are three such broods in your neighborhood

It might be noted that the name Cu i la tibuen of many books as applied to one of our harvest fine is an error prohably being a tropical species—the differentiation of species is largely based on the form of the male genital plates, although there are size and color differences—An attentive car can detect differences in song Of the genus Canda as now limited, the small spenes, hisroglyphica, with an almost transparent abdomen, may be found in pine barrens, and is our only species says, fairly typical of its genus, is the common one of our region. The somewhat similar Okinagana is more region in the Somewhat maintar thinagana is more common in the West than the Last in addition, it may be stated that the 17-year locust has been removed by Luts from the genus Closda and placed in the genus libicana, where it belongs by right of priority He

The Croadae are known as creadas, harvest fibs and locusts The eggs are laid on twigs The newly



The protective pyramids of earth made by the locusts

the female deposits her eggs in a succession of slits in the terminal twigs and slender branches of many kinds of trees and shrubs. About 15 eggs are placed in each slit The branches thus punctured frequently break off and The well known song is produced by the male In the late season the insects are attacked by the lower fungus Masospora cicadina developing in the abdoin It causes the posterior abdominal ribs of the insect to

Locusts emerging from the 16-year solourn in the ground

The following up to-date statement on this destructive insect is noted in Field Book of Insects just off the press by Dr Frauk F Jutz, Associate Curator of En-tomology of the American Museum

'The 17 year Locust, as a matter of fact is a 13-year locust in the South. The adult is of the same general shape as its relatives, except that its eyes and the prin cipal veins of its wings are red. There is nothing mystical in this color or in the W on its wings although the sudden appearance of the adults in large numbers has been supposed to forctell was. For about 16 years in the North the young as k at the roots of plants. Foward the end of this period scale-like rudiments of wings ap pear In the spring of the 17th year the nymph makes its way to the surface of the ground I v a smooth firm From late May to carly July it and other members of its brood crawl out singly or in droves t support, the adults having a week or so of serial life to

hatched young drops to the ground and burrowing into hatched young drops to the ground and burrowing into it, feed by sucking the judes of roots. It lives in this way for some time, the length depending on the species at appearance changing but slight!) Finally, it dig out by means of its enlarged front fert crawls on a tre-trunk or some such thing, splits down the back and ilterates the adult. The adult male sings often very loudly and shrilly by obstacting me infrances stretched nodly and shrilly by obstacting me infrances stretched node, me the base of the abdomen. Interesting as the carrier of a louist may be it is as

Interesting as the career of a locust may be, it is as nothing to the tragedy in nature of its extermination, after it has had the termenty to leave Mother Farth, dry in the sun and deposit its eggs. This extermination is brought about in the adults by a lower fungus which commences to breed in its body during hot weather This fungus belongs to one of the irost peculiar groups This fungus belongs to one of the not peculiar groups called Entomorphilorarens, because they are minute parasites which inhabit bodies of small fires and other insects. They are distinguished by the production of numer rous hyphae, or tubes which reclose essential protoplasm. The hyphae of insect-destroying fungi are of large diameter and fatty contents, ultimately emerging from the host in white masses of peculiar appearance I hey produce at their extremities large conidial or sexless sports which are violently discharged into the air and propagate the disease. In addition to these conidia, and propagate use unsease. In a mountain to unsease communi-ties propagation of the fungus, after long periods of rest, may be provided for by the formation of their walled creting spores, adapted to withstand auccessfully the most unfavorable conditions. Resting spores also may be either sexual or assextial. In either case they finally germinate and produce conidia in the locust that are discharged in the usual fashion, when they infest fresh hosts. Locusts, fises and other insects greedily eat these spores, thereby becoming infected and later destroyed as the fungus spreads through the body, absorbing all its edible contents for its own use

edible contents for its owns use. The hypothesis of infection of insects by contact with one of the condise, while possible, is altogether insprubble and not within actual recorded observation. Issuets are notorious esters of the spores of fungi. The larvae of insects, isoding on a fungue, likewas absorb the spore is described with the content of the spore in the condition of the content of th the varied elements, air, water, etc., to retain its germin-ating power under nearly all conditions for an indefinite period of time, to lodge on a weak spot of its own type of host, to cling there and breed whenever, later, oxygen of nost, to cling there and breed whenever, later, oxygem and temperature and monsture are agreeable to it. The fungus, however minute, grows larger and larger on the host's food, while the host grows thinner and thinner, until its vital organs are destroyed. The house of the locust or other insect is largely constructed of chitin, which no known fungus can utilise as food, and so it too must demise when its host can no longer provide food

The time to destroy 17-year locusts is while they are



Locusts drying out on a pine tree after emergence

on the bark of trees and shubs, drying out, a period of perhaps 10 days. Use an insecticide then or any other convenient means and kill them. Otherwise, the females as soon as they get strength, will leave the bark and proceed to lay their eggs on leaves and twags, destroying the foliags, later to roam with the males, destroying the foliags, later to roam with the males, destroying out the process, and destroy them by burning or in the roccuss off the trees by hand, however slow and arrive out the process, and destroy them by burning or in the foliage of the strength ment of Agriculture, Washingt

# Mountain Side Moving

Mountain Side Roving

UBSIDENCE causing services damage to properly

has taken place at the Weish village of Victoria. It
is attributed to a mountan sign, and to settlement of the
soil due to underground workings and the recent heavy
rains. The whole mountain side seems to be moving.
In some streets the pavenents have been rapped up, and
the rooted have collapsed, in one instance dropping
seems and the control of the buildings field, and house
which is on the increase at a rapid rists, extends to 30
houses and is estimated at over \$70,000.

# otrical Control for a Train of Motor Trucks or Other Vehicles

TEX heading of a train of motor trucks or other moving vehicles over ordinary streets, roads, rasks, or water, has been iffied of late by a new control system ed, this control system has wide posdibilities especially in converting our pres-ent excellent highways into real traffic ent exc arberies; for, instead of single trucks and trucks and single trailers, this system makes possible the handling of long trains

makes possible the sandling of long trains of many units, with the same facility as the single truck of the present day The newly-introduced system of elec-trical generation, control, and distribution is the invention of Rodolphus Fuller, a chanical and electrical engineer of Detroit. Mich It is said to differ from all other known systems of electrical control harstofore used on self-propelled vehicles In the general application the system of Mr Fuller uses four series-wound motor

for vehicle work, each motor driving an individual wheel The series field windings of the generator—for this system is a gasoline-electric one in the case of a motor truck so agrouns-encertro one in the ease of a motor truck— are multiple compound, and the electrical controller in conjunction with the electrical generator is the main feature of the entire system. This controller will operate any number of motors in sories, in series parallel, and in perallel in This arrangement gives quick acceleration with high power to overcome initial torque. Any aumber of motors from a single motor to any multiple of motors may be operated for any purpose whatsoever with this system

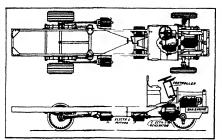
The control system does away with the use of all resultance in the main line circuit from the source of generation to the motors per-forming the work. The system does not use resultance devices to prevent too great a real of current to the motors when starting a vehicle from rest to acceleration The electric generator always delivers a gradually increasing voltage from rest to full acceleration, instead of starting with full votage in the circuit. In other words the voltage is generated from zero volts to full electromotive force, which keeps the generator electromotive force higher than the counter-electromotive force of the electric motors operating the vehicle

By referring to the accompanying wiring diagram, it will be noted that the generator

dagram, it will be noted that the generator series winding are duvided into eight sets of couls. Any number of coils may be used. In the first opention of the controller handle, the current does not pass through the Seld winding. It short circuits across the field winding. The four motors are in circuit with thomselves and the armatures of the generator. A small amount of surrent goes through the shunti field windings, also a small amount through the shunt field windings, also a small amount through the series windings, but not anough proroughly for rase this voitage in the circuit above windings and the series of the series slips off sontact and the current after it leaves the generator armature, passes through the first set of series field cods, resulting in a rise in voltage. A movement of the controller handle to the next notch passes the surrent

through two sets of series field coils, again increasing the voltage The movement of the controller is continued in a similar manner until the eight sets of series field colle are active and the voltage is increased to approximately 25 per cent of the maximum voltage of the generator During this time the shunt field windings have been in-

At this point the shunt field rhaustat becomes opera-tive, increasing the electro-motive force to its maximum motive force to its maximum for the full acceleration of the for the full acceleration of the vehicle. It is obvious from what has already been stated, that Mr Fuller's system of control operates by increasing pr decoming the magnetic field of Mild the control of the



Two views of an electrically-controlled motor truck driven by four motors

generating source. Some of the many practical uses which suggest themselves at present are. Motive power for railways, tractors, trucks for engines and similar apparatus, motor coaches buses (axicalis and sight

eing cars
In the construction of any vehicle for any purpose the control system under discussion embodies a maximum of flexibility and the greatest variety of speeds according of nexulity and an greatest variety of spaced according to Mr Fullers claims. A trailer or a train of trailers may be synchronised to turn in I track with the leading truck or tractor. Each trailir can be provided with motors, and in the case of delix y of freight each may be left at the respective station for unloading while the



Gasoline-electric motor truck equipped with a driving motor for each wheel

train continues with the other musts. I urthermore spetrain continues with the other unit i urthermore spe-cially designed trucks may be but for hauling extra-long lengths of material such as structural steel tele-graph poles maste, and so on and the length of the carrying body may be readly a lapid to the require ments if the rear wheels are int in by motors which are controlled through wares. In (it is any which the Fuller system of control his the gr at advantage of doing away with change sp. 1 gears or differential gears which wear and tear u.l. contribute understally ward the early deterioration fitl ordinary truck

The complete wiring diagram below tells better than how the Fuller system can be applied to a motor truck and trader

What to Know About Radio Activity

317

DOUBTLISS every intelligent person has now a reasonably good general idea of what radio-activity signifies. He understands that aside from the first radio active substance discovered radium there are a number of others and that there is a certain relation between them all knows that several types of radiation or emanation are given if he is aware of the fact that then is a n sort of progressive degeneration from one form of radioactive matter to an other. If he is bette, read on the subject than the average lay If he is better man he understands that the belium atom is suspected of a certain degree of com-plicity in all this business of breaking pherty in an this obstices it or taking down and he appreciates that the whole subject is intimately tred up with the very nature of matter even with its genesis. He may or may not have heard the half period mentioned-if he has perhaps he still looks upon it as a funciful conception of the novelist who with truly remarkable

foreaght or even more remarkable luck int upon this means of representing the rate of decay, and formulated the notions regarding the nature of the decay process which make such a means of timing it in orde

In any event whatever the extent of the lay reader s familiarity with this field be knows that it is the one thing of paramount importance in the chemical and physical science of the day. He would doubtless be of what it all involves if he knew where to look for that notion Accordingly, we have sought to meet this need—which we hope and believe is a real one—by commencing, in this week s issue of the SCIENTIFIC AMERICAN SUPPLE-

MENT No 2256 for March 29th, an ad men't NO 2236 for March 2940, an au mirably executed popular address upon Radium and Radio-Activity, by Charles H Viol Mr Viol is director of the radium earch laboratory of one of our enthusiastic corporations in the matter of industrial research, and is indeed an authority upon the subject. His address will run through three issues of the Surri E-MENT it will be found comparatively casy reading and sets its subject out in a most illuminating and interesting manner

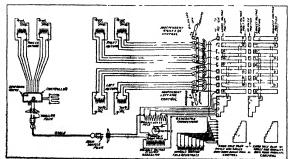
# Oil Fields in Alsace-I orraine

Wheel

A in lice or coal and potash, but also
considerable resource for France At a resource for France At a recent date,
the Commissioner General of the Oil 
the Commissioner reneral of the Off Commissee Senator Heary Rerenger accompanied by the members of the Interallied Conference, who were a tive in affording him all possible cooperation with a view of determining the distribution of supplies to the Allies and the early population made an inspection trip to the oil fields and the extensive plants already creeked and which the Germans had been operating. The center of the industry is at Pechelbroan to the northeast of 'trasbourg. Although the oil fields were known as far back as the 15th century, industrial working did not commence until the 17th century. Speaking of Procent dates in 1889 the annual

production was still small being only 6 000 tons of crude oil but in 1900 under a Prus-

sian company the production rose to 30 000 tons During the war a very active explortation caused the amount to reach 50 000 tons. The prod. ucts obtained from the Alsa tian crude oil consist capecially of fatty oils such as are useful as lubricating oils or 65 per cent of the total while the amount of kerosene and gasoline is smaller than for many other crude oils. It is considered that the 40 000 tons of lubricating oil supplied by the Pechelbr fields represents no less than 50 per cent of the total French consumption As re gards gasoline, only 2 per cent of the national con sumption can be thus sup-plied, and for kerosene still The Oil Committee is now engaged upon active measures for operating the oil fields



Wiring diagram of an electrical system of control for motor trucks and other self-propolled vehicles



General View of the Chlorine Plant at Edgewood

! Salt proparation building . Substation 8 Cell bouse No 1 4 Cell bouse No 2 5 Chilorine ! ying towers 6 Chierine ; gas-pipe line to chemical plant 7 Boller and evaporator bouse 8 Caustic fusion 9 Dr making shop

# United States Chemical Warfare Service—I

# Building a Poison-Gas Plant With a Capacity of 200 Tons Per Day

THI unroduction of poson gas by the Germans was a military as well as a moral blunder—a moral blunder because its use was expressly forbulden by the Hague Conwintion a military blunder because when the Germans decided to introduce the form of attack they made the missists of not well attack though the whole line. It was well for the Allied cause that they whole line. It was well for the Allied cause that they whole line. It was well for the Allied cause that they impationer was committed when they introduced the impationer was committed when they introduced the submarine attack inpen mer chaintine. I he mention of waging such warfart long autodated its introduction and the Commission of waging such warfart long autodated its introduction of waging such warfart long autodated its introduction of waging such warfart long autodated its introduction of of our or five bundred, and then launched their attack, the result would have been fastal to the Allied cause.

However terrible although the first attack with gas proved to be it was limited in area the Allies came back with the gas mask and the Germans chance of a decision shipped by The Allies in self defense made use of gas themselves and ultimitely surgessed Germany in the style of warfar. More than that with the entry of the United States into the war we developed our gas-making facilities at such a rapper rate that at the dose poseon gas per day and if it had not been for the armstere, we would could have sent by I say 1st to the waterin front over 200 tons of gas per day to be sprayed in shells over the whole German front. What the would have meant will be understood when it is stated that the total output of the German front. What the would have meant will be understood when it is stated that the total output of the German factories was only 30 tons of gas per day Furthermore we have learned since the armstice that the greatest amount of that most deady product mustard gas that the Commiss could manufacture was a manufactured to the control of the control of the country of 28 tons of mustard gas and by Innuary 1st would have been in a position to ship overseas 100 tons of mustard gas daily.

# When We Entered the War

At the time of our entrance into the war we had very little knowledge as to what materials were employed by the enemy and how the stuff was made. But in November 1917 the Government deceded to build a small shell filling plant on Gunpowder Neck Maryland which formed a portion of the Aberde: Proving Ground received and it was at first inter all of have the gas produced by chemical manufactur rs and shupped to Gunpowder Neck for leading stock helds In December 1917 the Government had diled that a bottler plan would be to build it sow the all plant and manufacture the toxic materials staelf. At that time the property taken over at the Gunpow ler Receivation was largely cultivated farm land and there was no provision for bouring men or for brunging materials to the site



A fromen cube of mustard gas

Bunk houses were at one built and railway spurs were laid from the Pennyivanan Railwad Construction was started in apite of the extremely severe winter of 1917-918 A water supply of 24 oloy gallons pr. minute for manufacturing was brought in from the Bush River The shipping facilities via the I cinsur/vana Railwad were supplemented by dredging a thansil from the reservation to Chesspake Bay to admir of shipment by water

# The Government Erects Its Own Plant

Because of the urgency of the demand it was decided to sall at one upon the chemical manifacturers of the country to assist both in investigation of processes and in the production of gas — The man facture of chlorpierin was begun by a firm at Stanford, Conn., and of phosgene by a firm at Nagara Falla I was during the winter, as a result of the growing importance of gas warfars and of the representations of French and British officers who came to the United States, that the Government determined to creet a very large dulorine plant of its own, and in January 1918 Cell Walker who has been so long and favorably known to our readers as Prof Walker of the Massachuscits Institute of Technology, was made commanding officer of the Cupporder Reservation, which is now known as Fdgewood Arsenal In July, 1918, Edgewood Arsenal am and a part of the Chamical Warfare Service under the direction of Maj. Gen. William I. Sibert.

The Ldgewood Arsenal comprises the following seven

departments
lirst, an executive office which was moved from
Washington to Baltimore and was located in McCoy
Hall one of the old Johns Hopkins Turversity buildings
second the construction maintenance, and stores
devision that the headquarter military organisation
fourth a military medical hospital, and then the great
gas manufacturing plant proper, including, fifth a
chlorine plant for the manufacture of caustic soda and
facture of toxic materials and seventh, a plant for filling
liquid chloring sixth a chemical plant for the manufacture of toxic materials and seventh, a plant for filling
the shells Livens projector drums, Stokes mortar bombs

hand greaades etc.

Apart from the construction of the plant itself, a large
amount of important engineering work and other constructional work had to be done in bousing and taking
care of the civilian labor which was employed in putting
up the buildings etc. and in housing the operators, who
numbered 5 500 and who were all enlated mon. The
portation formed a military organization and regular
barracks were built for them, and they were subjected
to the same offill and discipline as are found in an army
prawnt in a posson-gas sublishment; it which
the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the subject of the su



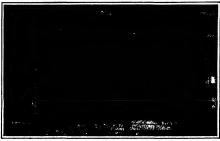
Exterior view of cell building Two of these 82 ft. wide; 540 ft long



Interior of a cell building. Capable of producing 50 tens of chierine per day







The great tanks in salt preparation building, with tank foundations in foreground

### Rapid Construction of the Plant

There was a hurry call for the construction of the gas plant, and the response made both by the sugmeering and channels experies, who came out of crul filled to assist the Government in this emergency, and by the consistence and absorber forces, forms one of the most creditable chapters in the shatory of our war schievements on this seed of the Adatare. Although ground was broken in the what of 1917-1918, it was not until abantary, 1918 that until the contract of the contra

Two cell buildings, 82ft by 540 ft, a salt-treating building, 175 ft by 233 ft, evaporator and boiler house, 203 ft by 229 ft

A drum-making building 82 ft by 200 ft A caustic fusion building, 98<sup>1</sup>4 ft by 348 ft

Twelve magazine buildings, 100 ft by 200 ft

A chlorine pipe trestle, 2,494 ft long, carrying
three 8-inch pipes for the transfer of the chlorine

from the chlorine plant to the clumical plant.

Permanent barracks buildings, comprising 16 two-story tile-wall structures, each 50 ft by 200 ft, electrically lighted and with every accommodation,

capable of housing 2,050 men

A water-supply system, including a 1300-foot dam, 6 feet high, an electric pumping system, two pipe lines, 10-inch and 12-inch, extending for 0,200 feet to a reservoir at an elevation of 155 feet, of a capacity of 1,600,000 gallons, two pipes, 10-inch and 1-inch, extending from the reservoir 0,000 feet to the reservation, where it is distributed to 11 miles of mans, 16 inches and 14 inches in dismeters.

As showing the rapidity of the work, we may take the case of the construction of the chlorine plant, which consists of two large buildings each 82 ft by 540 ft and 24 ft high Detailed plans were received on April 26th Work was started on the cell building on May 1st and the first of the four sections was ready to receive cells on May 27th, and the last section on June 11th

Again, excavation for the salt-treating building was



Filling hand grenades

started on May 17th and on lune 1st foundations were ready for six of the tanks, and sill were completed before the 20 tanks that had been provided for arrived. After the tanks were up, overhead rairoad tracks were built above them and with these preparations everything was

in place ready for the first carload of salt on July 14th. The chlorine, gas is used at a themical plant located some detainst away with a tide-water swamp inter vening. The gas is jupied and to maintain the pupes at the proper clevation is wood circuit, eachy hall a mile long, was built between the chlorine plant and the inclinated plant. Work, on the trestile was started May

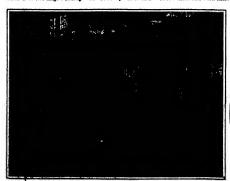
30th and the first pije (line was completed on July 4th. Current for the plant was secured by tapping a source of supply 10 miles distant and bringing it in on overhead cables to an outdoor sub-stanton containing a bank of three 333 km transformers. This station was ready for service on July 1st and while the above described work was in progress, culisted men were assembling the cholmer. cits and on July 4th enough cells had been completed to produce two and one-half tons of obloruse gus per day and diviser it to the chemical plant.

# Fifty Tons of Chlorine per Day

The developments at the chemical plant did not purms the use of the gas at this time and, hence, the plant did not go into operation until the first day of septimber, when the two and one half to nuit was first used. But before the armstine was supped, the plant was randy to produce. 50 toos of chloring as every 24 shours, although the greatest duly requirement at this time was 25 one.

The plant has been designed with the view of increasing the capacity to 100 tons of chloring gas per day, and early in the construction proof, the order was received to build cell building No 2; retary converter building No 2 and to purchess and usual equipment duplicating No 2 and to purchess and usual equipment duplicating that in the first unit. This additional work was produced in the control of the cont

Another remarkable piece of rapid construction was the building of an auxiliary 20 000 kw power plant at (Continued on page 78)



View at the top of a mustard gas unit, showing gages and piping



Latest mustard gas unit; capacity twelve tons per day

# The Heavens in April, 1919

# More Investigations of Star Brightness and Distances

By Professor Henry Norris Russell, Ph.D.

ONE of the most interesting papers of the past month Comes from Swelen where at the University of Lund a group of very efficient students has been gathered under the distinguished direction of Dr Charlier The present discussion by Cylkinberg deals with a remark able and little understood class of budies the variable stars of long period

Store of this sort have been known for a long time Stars of this sort have been known for a long time-the first discovery that of the famous Mira Cet disting back to the year 1596. In recent years the number of discoveries has grown apace. Of the set all the transfer are known to vary in this fashim and cyllenberg son cludes from his discussion that | retably at least as many

more remain to be discovered there are few more d finite classes of celestral objects The periods of variation the dwars long averaging about did days and are groups I pictty closely about this mean

three quarters if them lying between 200 and 400 the range of variation is great. Two-thirds of those which have been followed through the whole cycle of variation alter their brightness by more than three magnitules that is they are more es as bright at maximum as at minimum-while

one third of them all change by more than fiv magnitudes that is by more than a hundred fold in light—and a few are more than a thousand times brighter at their best than at their poorest

Spectroscopically these stars fall into a very well-marked group They are all decidedly red with spectra showing broad bands, due to the presence in their atmospheres of the vapors of certain chemical compounds—usually the oxide of titanium whose existence proves that the atmo-spheres of these stars must be relatively cool, from the stellar standpoint though from the terrestrial side they are as hot as an electric furnace in full blast dition to these bands and to the ordinary dark lines their spectra show the lines of hydrogen bright, and often very conspicu ous especially near maximum This indi ous especially near maximum. This indi-cates that in some way the atmospheres of these stars contain large quantities of hydrogen which is hotter than the rest of the atmosphere—perhaps something like the eruptions of hot calcium vapor around sunspots which are revealed by study of the sun with the spectroheliograph

But the origin of these spectral peculi-arities and of the still more remarkable variations in brightness remains obscure Anything that can help to clear up the situation is very welcome and Mr Cyllenberg has made an important contribution by obtaining a good estimate of the average

It has been known for some years that the red stars which show the bands of titanium oxide in their spectra—call ( lass M in the Harvard classification - fall naturally into two groups of very different brightness. One group the so called giants averages 50 times as bright as

gunts averages 50 times as bright as the sun or thereabouts. The other group the dwarfs averages less than one per cent of the sun's brightness. Though there is a good deal of difference between anough there is a good dear of difference between individual giants or dwarfs as the case may be, the two groups are a long way from overlapping and as far as we know they are quite distinct

### Classifying the Variables of Long Period

To which of them do the long period variables belong? We cannot give an answer based on direct measures of parallax for only one such star has thus far been oh served for parallax and with rather inconsistent results

served for paranax and with minor inconsistent results But an answer is possible based on the apparent proper motions of the stars in the heavens if these variables are dwarfs they must really be very faint and to look as bright as they do they must be pretty near us—at distances of ten to thirty-light-years, for the most part. If they are as near as this, their years, for the most part. If they are as near as this, their own motions in space and the apparent drift arising from the motion of our own system will early them across the heavens at a rapid race, for stars which could not fail to be detected by observation. If on the other hand they are gainst, they must be at considerable distances, or else they would look brighter than they do, even at maximum, and being thus remot their apparent motions in the heavene would be slow

The writer, some years ago, show I that the motions of the few stars of this sort which at pe ar in Boss s cataof the few stars of this sort whom a plan in holes a cata-logue were so small as for make it very probable that these stars were giants. Mr Gyllenters has repeated this discussion, with considerably n n. extensive data gathered carefully from various reliable sources, and confirms the conclusion. From the verage duft due to the sun's motion he finds that the verage pacellax of 24 such variables is only 9 '005 whi | suid correspond to a distance of more than 600 light ars Working on the assumption that all these star are equally bright when at maximum (which though | mobally not at all areas). exactly true affords a good enough t sis for a preliminary discussion) he finds that, at maximum the long-period discussion) discussion) he lines as bright as the sin and hence is a good bright guant star. At manimum these variables probably sink to the sun's brightness and goods bright guant to the sun's brightness and goossibly below it in a few cases. But it is clear that speaking by and large they are objects of great him ossty.

This settles at least one thing abo it the nature of their

At 12 o clock Apr 7 At 11 is o clock Apr 14 At 10 o clock May 7 At 94 o clock May 15 At 9 o clock May 15

At 10% o clock April 30 NIGHT SEY: APRIL AND MAY

variations They are certainly not stars which are at the variations. They are certainly not stars which are at the point of going out, and flaring up at intervals like a caudic flickering in its socket. The financest dwarf red stars are apparently meaning extinct in according to all the available evidence, but they are not variable, so far so is a triveact known. Variablely of the type is a property of giant stars which the n good reason to suppose to be in an early stage of their career, and it looks at present as though they were perhaps to be regarded as bright stars which become faint at intervals rather than as faint stars which at times flash out bright. rather riam as faint sears when at times made out bright We are still far from a solution of the problem but it is an essential advance to know that we are dealing with very bright stars, which are alm at certainly of large diameter and low density as well

### How Big Is Our Stallar System?

Mr Gyllenberg completes his discussion by calculating the actual positions in space of 700 of these variable stars, on the assumption that their maximum brightness is in all cases 150 times that of the sun. The results indicate that these stars are apattered through a huge region, extending along the plane of the Milky Way to a distance

of at least 4,000 light-years in all directions, while scene of them appear to be not less than 5,000 light-years distant. At night angies to the gladest plane they extend on both ados to a maximum distance of 4,000 light-years of the plane in question. This distribution is family similar to that which was calculated by Shapley and the writer some years ago for the eclipsing variables, though the later calculation makes the inuits of the great star-cloud within which our system has somewink larger It is probable that in limits of the scheme of the great star-cloud within which our system has somewink larger It is probable that in limits of this cloud of stars have been youghty distall, but along the plane of the Gladay; it is not probable that this investigation, any more than others, has "struck bottom," for the study cannot at present be carried to faint enough stars, and the maximum estimated durlance of any of the stars studied by Cyllebneg is but one-third of the distance saugned by Shapley to the nearest of the globular clusters.

### The Heave

At the time set for observation, which is in April an hour later than usual by virtue of the daylight saving,
the Great Dipper is above the Pole, and
nearly overhead Below it and stretching

far to the eastward is the long curve of Draco, enclosing the Little Bear in its colls. Drace, encusing use Latter sear in te cons. Below the Pole are Cassiopers and Cepheus, deep on the horizon. In the northeast Vega has risen, with Harcules higher up on the right, and Corona farther in the same direction, while in the east Arcturus rides high above the tangled outlines of Serpans and Chiburgham. and Ophiuchus

Wirgo is well up in the south and Leo in the southwest Below them is Hydra, with Crater and Corvus on its back Far to the southward, on the horison, observers in Florida or southern Texas may, in clear weather, discern the Southern Cross

The western sky is the brightest of all, with Auriga in the northwest, Gemini on the left, and then Canis Minor Jupiter, which is in Gemini, and Saturn, is Leo, add to the effect

# The Planets

Mercury is an evening star at the beginning of April, but passes through conjunction between us and the sun on the 8th, and becomes a morning star By the end of the month he may be seen in the morning twi-light rising about 515 A M, summer time but he is not very well placed for observation in this latitude

Vonus is an evening star in Arms and Taurus, and is coming steadily farther At the end of the month she remains in view till nearly 11 P M by the clock, and appears about five times as bright as

Mars is theoretically an evening star, but is actually much too close to the sun e visible

to be visible
Jupiter is an evening star in Gemini, and
remains in sight till about 1 15 A M. These apparently remans is agist till about 1 15 A M. These apparently inconsistent statements may be reconsiled by a consideration of the planet a high northern declination and the hour s shift in the clock. Satura is in Leo, crossing the meerdan at abest 9 P M in the middle of the month. Uranus is in Aquarius, and rises about three hours before the sun at the said of the month. Meyticas is in Canore, crosses the meridian at 8 P. M in the middle of the month.

Callery, orders are the property of the months of the months of the month of the mo

# World Markets for American Manufactures

Edited by LYNN W MEEKINS

A department devoted to the extension of American trade in foreign lands

## Electrical Progress in China

COME yours ago a famous American bandmaster composed a march that still retains its popularity The title, "Hands Across the Sea,' originally alluded to the Atlantic Ocean, but now the same expression is being sha Atlantic Osean, but now the same expression is being used monnection with the Pacific Osean, and the hands generally indicated are those of the Chinese Recently the Chinese Industrial and Commercial Association of Chinege was formed, the first organisation of its kind in the United States I sto-Opicit is to promote commercial relations between China and Amorica At the opening season the Chinese Consul-General at New York brought out the interesting point that the United States is the only country that has not had a special motive in dealing with China Other nations have tried to exploit the -the Americans have tried to help them As a soult, they want to buy five times as much from us in

result, they want to buy five times as much from us in the tuture as they are purchaning now, and \$1,000,000 has been raused by Chinese morchants in San Francasco toward the establishment of a new etamahip line between San Francasco and Shanghai "American manufacturers have a good opportunity at present to develop the Chinese selectrical field, "said an American auginose who visited the Far East lisat years and the fire selectrical services and the necessary ap-paratus and materials Not more than 100 Chinese utiles now have electrical service, but hundreds of others are good prospeate. There are several plants in prospects. There are several plants in Peking, Shanghal, Hankow and Tentan, the foreign and native sections being served by different companies When I went to China, my firm had received very disby different companies When I went to China, my firm had roceived very discouraging reports about the industrial backwardness of the country, the low purchasing power of the people and the active competition of Japanese and British manufacturers. The first of these obstacles will be overcome by the investment of American capital and the furnishing of control of the control of th

# Our Steadily Advancing Trade

The growth of American trade in electrical goods is shown by the value of the imports into China from this country during the fiscal year 1918, which was about during the mean year 1918, which was about \$1,000,000, compared with approximately \$125,000 in 1913 Last year the United States supplied dynames or generators, fans, insulated wire and cables, motors and

States supplied dynamos or generators, fans, naukated wire and cables, motors and telephones. Oppressive summer weather and telephones. Other operated Both portable and central fans are used. Often operated continuously fee a whole day or more, they have to contend with severe humidity conditions that cause in suitable leaks and breakdewns it is so damp along the count from Canton to Shanghas and the north that fans often give annoying above. Under trying conditions the American fan has given much more attactory service than its foreup competitors, and the country service than its foreup competitors, and the country of the

up appearances. When one Chinaman gains an ad vantage over another, the latter loses face and can regain his standing in the community only by getting back at his competitor. So if our retail shop is persuaded to purchase a complete electric lighting system other shops by to meet the standard. In the opinion of an familiar with electrical possibilities in China, small lighting sets can be sold ( ttensively if manufacturers will send agents to demonstrate such apparatus

## Meeting Competition in Telephone Instru

It is reported by an American Trade Commissioner that notwithstanding the theap labor of Japan, American telephone manufa turens and turn out instrument as low-prood as these of their Oriental competitors. Nickel plating sends badly in the humid climate of Shanghai and Its jured brass finish is preferable. Not long ago an American company made the lowest bad in connection with a Chinese covernment telephone contract, but intead of gying it the order the Chinese official in charge gave the American figures.



Japanese travellur commercial exhibition in Manchuria



This Chinese city needs electric lights

to another bidder and placed the contract with him because the official had been properly squeezed, 'that s, fianneally unfuenced in advance.' The American company, however, was looking out for the and finally landed most of the banness in spite of the Official Shanghai is the only city in China where the larger types of electronal cooking and heating applicances have had much sale. When central stations in other cutse and carboly mercased market Modern behang a systems are generally lacking, although the writers, especially in North China, see tigroom. The houseboy and the cook, who prepare the food for foruge residents, do all they are to genourings the use of oad or wood stores, sook, who prepare ass reod for foreign resonant, on all their and to encourage this use of coal or wood stores, because the desired results community to the feet one American hand; who used an electric range found its servants so wasteful of current that it had to go back to the antiquated but chapper coal store

### Selbne Methods and C I F Prices

The methods of selling America of circula goods in China are through the branch house of manufacturers, thing are through the orange in as so insinulacturers, through local importers acting as in unfacturers agents with exclusive sales rights or by bruches of American commission houses. I keep in the case of apparatus bought direct by central stations the importers sell the goods to Chinese dealers who act as jobbers and dis-tributors through outport merchants. These sales are made through compradors who are more then credit men, because they generally guarantee the accounts of their customers. The disadvantage of the comprador system is that the importer is prevented from learning enough about local conditions to develop his business to the fullest extent. He does not become well acquainted with the ultimate consumer and he runs the risk of losing money if the comprador sets aside more than a legitimate share of the profits

The Chinese nicrohants desire as a rule c 1 f (cost insurance freight) quotations—American exporters have been known to quote prices for be (free on board) inland town in the United States and the bids

have been refused because the importers lacked information on American railway freight rates and were unable to figure the freight rates and were unable to figure the cost of the goods landed in China. In one case a British manufacturer named a c 1 f price for certain goods and an American maker quoted f o b at the American laster quored 10 b at the factory. The Chinese importer spoke to the American Consul about it, and with the aid of that representative he figured out delivered prices on American goods, which provid to be lower than the British, and swung the order to the United States Lven when ocean rates make it difficult, if not impossible to reckon the cost insur-ance and freight prices free-on-board at an American port enables the Chinese importer to estimate the total cost of his order The Chinese want to buy a great deal more from us and it is only fair to make it easy for them The most effective advertising for

American electrical goods in China conparticular chop or trade mark of the American manufacturor The Japanese have employed among other methods of publicity, traveling commercial exhibitions publicity, traveling commercial exhibitions in elaborately placardid trains which attract much attention in the towns and villages through which they pass. As new railway lines are built and additional territory is opined it would set im worth while for the branches of American firms in Nanghai Haikov and other Chinese. in Snangnai Dankow and other Chinese, ports to arrange for American advertising enterprises of this sort. The Chinese buyer invariably wants to see actual samples, and this would be an effective way to place American manufactures before him

Extraction of Turpentine in Germany BEI ORL the war Germany imported oil of turpentine from southern France The fir trees of southern France contain less late and more turpentine than those of Germany The latter require a greater proportion of fatty substances to enable

them to withstand the rigors of the German winter

The extraction of oil did not prove remunerative as the
oil-producing qualities of the German in trees compare
unfavorably with those of Pranc. and it is impossible

to make the industry a paying one under the conditions A very easy method has been successfully tested for A very easy method has been successing testes nor the extraction of oil from ir needles the resulting product possessing good technical qualities and remark-able power of resistance to cold temperature. This process has been substituted for the expensive method of process has osen substituted for the expensive method of extraction by means of sichoil, which is practically im-possible under present conditions. Preparatory steps have been taken for employing the process, and in the future the national economy of Germany will benefit by the extraction of several hundred thousand kilos (a kilo-22 pounds) of oil, pure oil of turpentine (turps) will be an added article of competition which according to ex-perts will compare favorably with the French product

# Inventions New and Interesting

A Department Devoted to Proneer Work in the Arts

# Animating Stationary Signs by Means of Colored Lights

THERE is nothing new in the principle of the absorption of light rays complomentary colors. Indeed complementary colors indeed M Luckiesh a recognized authority or 1 i and illumination and a frequent a tributor to these columns demen trated some years ago the effect on paintings various colored illumination with the various colored minimization with the resultant altert appearance of the pictures to a marked dept. But the re-ise distinct howelth to the practical ap-plication of this principle t advertising signs which is covered in a patent re-entity granted to Richard M. Craig of New Aniono, Lyns.

San Antonio Icxas
According to the specifications of his
patent Mr Craig paints the subject
matter of his sign in two positions one position being shown in red and the other in green Then he arranges both red and green lights for illuminating the sign and alternately switches the current from one group of lamps to the other by means of a motor driven switch. In the accompanying illustration for example is depicted an animated sign consisting of a rocking chair and a see-saw. These articles are each painted in two colors in red for the first extreme position and in green for the second extreme position. In broad daylight the two positions in In broad divigate the two positions in red and green show plantly—but when illuminated alternately with red and green lights, the sign becomes animated in a most startling and convincing manner

## A Phonograph Without Tone-Arm, Sound-Box, and Horn

SOME THING radically new has at last been introduced in phonograph in-struments Indeed the more or less com-plete standardization which has long obtained in reproducing phonographic sounds is now threatened by a recent development which is as ingenious and starting as it appears officient

In brief, the development in question is the climination of the usual tone-arm sound-box and horn Instead the new sound-box and norn Instead the new system of reproducing phonographic sounds makes use of a cone shaped parch-ment diaphragin held in an aluminum ring which in turn is suitably suspended ring which in turn is suitably suspended by a trunnion and swivel mounting so as to bring the long stylus arm to bear on any portion of a disk record—the free end of the stylus arm terminates in the conventional needle holder which takes steel or fiber needles as well as the vario is newel and some or maneut styluses giving the aluminum ring a slight turn the diaphragm is really to play cith a hill and dale out or later dout records It will be noted that the vibrations from

the record groove are transmitted by a long brass hour which passes through the terminates at the apex of the zone is said that this arrangement of inpart ing the vibrations to the parchinent diaphiagm ages more or less of the resonant surface to vibrate according to the barmonic requirements of the vibra tions The cone amplifies the sound to such a degree that a horn is unnecessary in fact it is the chimination of the houn with its inevitable characteristic which generally afters the purity of the sounds emitted by the phonograph disphragm, and which causes a muffled

In actual operation the new phonograph gives pleasing results. On band and orchestra records it gives a fullness and depth of tone that is seldom if ever apph griphs to use f the low matural torc of the jai hment On vocal acketions well

# A Caliper That Carries Its Own Scale

THL time honored methods of calipering a piece of work is to transfer the measurement with the ordinary calibers to a steel rule or to adjust the cappers from a sterl rule ately requires con siderable skill The tool here illustrated



An indicating caliper, a useful tool, which insures accurate

simplifies the process by combining the rule with the calipers, and the gradustions on the rule are chlarged to double or triple scale, so that measurements can be made with accuracy As clearly shown in the picture, one of the caliper arms is formed with a toothed sector which engages a pinion on the other arm. This pinion carries ar indicating hand which sweeps over an indicating scale in the model here shown the graduadrodths of an meh although they are

actually three times as far apart as that, so that it is possible to measure accurately to a three-hundredth part of an inch a larger model the graduations represent sixty-fourths of an inch and are doub scale, so that they can easily be read to half a sixty-fourth

half a axty-fourth. The arms of the caliper are adjusted by means of a trigger placed conveniently mear the handle, and there is an adjusting screw on the handle operated by a thumb nut, which may be brought into engagement with a spur on one of the arms to lock the instrument at the desired meanurement at the desire stred measurement or regulate the opening of the arms to a nicety Provision is made to compensate for any wear in the gear teeth so that the caliper remains always an instrument of precision

# Recent Patent Decisions

With Reference to Novelty .- Patent With Reference to Novelly.—Zacut for a cable hanger by which to attach lead tube carrying electric wires to a supporting steel cable, called a messenger, held valid. This consists of the loop and hooks, a pair of spacing arms ex-tending outwardly in opposite directions from the neck of loop passing obliquely understath and along the sides of the underleath and along the sides of the messenger wire and ending in ordinary overhanging hooks. On first view it seems like the primitive hanger with hooks set above the loop, but on closer inspection it is apparent that the hooks are farther apart, and that they grip in a way the hooks of the early hanger did not —Bonua Mfg (o v Blackburn, U S ( A of Pa

Design Patent vs Mechanical Patent .- The Pick patent for an improve ment in drinking glasses consisting of a shallow bulge below the rim, held valid. The bulge is not ornamental and hence the issuance of the design patent could not invalidate a prior mechanical patent for such glass on the ground of double patenting—I erd Messner Mfg (ov Albert Pick & (o USCC A of

Option to Take I icense -- Provision of contract giving one the privilege of becoming at a certain time, exclusive heense to manufacture under a patent, provided he give 10 days notice of his intention, and within such period furnish a bond, gives but a mere option, as to the exercise of which time is of the exence—
Lafe Preserver Suit Co v Nail Life Preserver Co U S ( ( A of N Y.

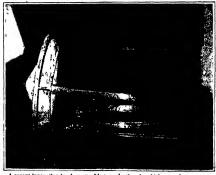
No Jurisdiction .- Equity is without No Jurisdiction.—Equity is without jurisdiction of a suit for infrangement, where defendant had used only one of the alleged infringing machines, had ceased its use and dispessed of it months before suit, and did not threaten further use.—Mumper Ldy Co v Natl Marking Mind: to U S C A of Jones with its Disclosure?—In a suit to many office of the suit of

enjour infringement of patent, where plaintiff claimed that the present commercial form of his invention was not a departure from the original disclosure. plaintiff had the burden of proving that any journeyman of the art could turn from present form to former with any certainty of result. An inventor mute do more than give cues for future exdo more than give cues for future ex-periments, and, unless he is dealing with elements whose action and resection is known and certain, he must disclose how the combination will operate.— H Ward Learned, Inc. w Mazusell Meior Sales Corp. U.S. C. C. A. of N. Y. Basis for a Patent.—The only bigsis for granting any patent is the specifica-

ed on page 227)



By painting signs in red and green and using alternately a red and a green light, j startling azimation may be secured



A recent innovation in phonographic reproduction, in which a parchment come acts as the sound-box and horn combined

# TIMKEN

# Why It Means a Well-Built Truck



Dotted lines show how the inside of the "cup" of a Tunken Bearing is tapered to fit over the tapered rollers.

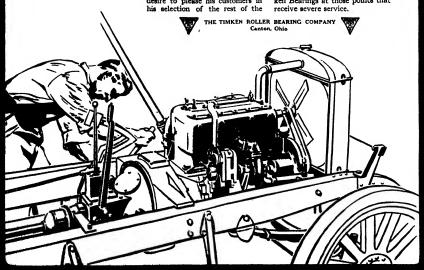
When you find Timken Bearings in a truck it's a pretty safe indication the truck is well built. The bearings cost the manufacturer more than other makes but he was glad to pay more because he knew these bearings would go far towards making the truck give you good service.

If a manufacturer displays his good faith and incerty in the instance of bearings, you feel assured he has shown the same desire to please his customers in

car's equipment. He has purchased the very best that the market affords.

As proof of this, just put down trucks that you think of. Or take twenty, or fifty, or as many as you can remember. Check up these names with the list included in

"The Companies Timken Keeps"
—a booklet we will send on request—and you will find the big
majority are equipped with Timken Bearings at those points that



# Recently Patented Inventions

Brief Descriptions of Recently Patented Mechanical and Electrical Devices, Tools, Farm Implements, Etc.

### Pertaining to Aeronautics

Perialising to Aeromantifica
A (11 ) 10 R FOL 3 R BOPP ANK STABIL
IFERS 3 B Leaw to Litark Ass. New York
N Arroung the pitchpale objects which the
inventor bas in skew are to provide a stability
it; an objectivity image andel by head with
pressure to provide a stability result to provide a stability
attendament of the provide a stability of the provide as a stability of the provide as a stability of the provide a stability of the provide as marker resources weight memore and an act years of the finance of relation and to provide an a marker which the member disposed responsive to never nexts of a carrying member in a vertical plane.

carying member in a veril at Janus THRIGHTE PARISHIL C. D. Fairst Deed address Mer. Nells Fairst LEW. It is a New York. S. Vanong it objects of the layeration as to provide an adost; which will ambod in the construction appreciate from where D. It will be impressed to for a sections dis-serted a soft power of the provided and soft particular of any of the nection and the provided and provided and the provided and provided prov bags and to provide means for steering and

all IGHTING AND TAUNCHING STAGE
FOR AIRPLINES—I G Burron 142
Broadwir New York N 1 The object of the
invention is to provide an alighting and issueching stage for me on sylation fields hous tone decks stage for me on whathon fields home tops do ke of mainte week leant the like arranged to house a safe adjecting of an alriphate and to check the momentum thereof in a cemparatively store space and to allow of pre-zerly launching the aliphane into the air. Archive object is no recolder a durable construction not hable to act

### Pertaining to Apperel

Per tutaing to Apparel

NEC KTII—W Nate with lark Place
Brooklyn N Y This invention has for an
object the provision of a construction where to
the ite may be removed from collacted; without
unitying the knot. A further object is to provide
a retaining her for the small and of the lik, and a har or strip formed with means adapted to be socured to the side of the wearer so as to hold the tie near the side without regulring the use of

a the sign. BI 170N PASTENER — I DAMLOREN 1212 Broadway New York N N I he object of the diversion is to provide a button frastene arranged to permit the worker of a gazment hat or other weating appeared in Acother object is to permit the use of the frastener output fasten a button to the weating appeared. Acother object is to permit the use of the fastener output fasteness that are cloth instances apprired buttons up buttons such as cloth instances apprired buttons up buttons and the like

Electrical Devices THERMOSIATIC CIRCUIT (LOSER —M
F Annas 105 Fulton at Brooklyn N \ 1 the
invention relates to thermostatic circuit closers involved reasons to diremonant circuit concerns suitable for closing circumstant circuit operating values or any other purpose where action under thermal changes is desired. A specific object is the prevision of a thermostat in which one of the elements is a tube and the other a jdurality of untwisted strands of wire the tension of which can be readily adjusted according to the delicacy

Of General Interest

BOTTLE CAP A I Barraron Evantyllic ind The prime object of the invention is the provision of a cap construction which will avoid provision of a cap construction which will avoid the me centry of ercowing the cap upon the hottle and which will thus avoid a great waste of time in opening and closing the hottle during the gradual using of the contents and also avoid the initial manual errowing of the cap prior to the applica-tion of power thereto for compressing the sealing member in the first instance.

PERCOLATOR -P MALAME CON DORDING and Fractions is New Orleans La The invention has for its object to provide a percolator adapted for use with a heater wherein the acrangement is such that the percolator may be arranged to retain the burner with a blue flame during the making of the coffee and to permit the heater to hurn with a white flame after the coffee has been made or wherein the percolator may be arranged to extinguish the heater when the coffee

ICK BOX AND WATER COOLER -PETERS I resett Ark The invention relates partieutry) is an fee box hasing a safer cooler structure forming a part thereof and having for an object the prevision of an arrangement whereby les will set in a double capacity of cooling drinking water and the contents of the refrigerator in sub-stantially the usual names. File container for drinking water is supplied with an indet and an outlet member. The fee chamber is constructed to prevent the loc contains in direct contacts with

NATIGATION INSTRUMENT—OLD Peon.
IS Thomas wit New York N Y. The object of Marian Control of Marian William Control of Marian Control of Ma

sections of the spinal course.

(1) N (10) N | P | P | Das Frosco-senas,
cas of Maxima Nuntitions Copp. 120 Broadway.
New York N. This involving relates to grammounts utilizing a bail and a secked-folia wheelythe gam may be addistated or wearing in any direction dealered and wheely the gam may be leaded
in tithis a bordround plane in any adjustment,
or in a vertice plane in any adjustment.

or in a vertical plane in any adjustment.
Lil B. BELT.—P BRAUNE acro of Monticello
Public Schools Monticello. Via This invention
relates to a fife aving appliance including an
inflatable life bols, and a gas generator adapted
to be beld on the bods of the water of the bods,
the generator being adapted to contain a substain or with in the presence of water will generate
a gas for inflating the bol;

BUIL RING DO D HADDERICK, R. P. D. NO. 1 Chazy N. Y. This Invention relates to animal now, rings such as and sucking or builtings its older is to preduce, a durable device (apable of cas) application and one which will



A PLAN VIEW OF THE DEVICE

not interfere with the animal while eating or drinking. The lower loop can be used as seeding integrand when used as such the device cannot be pulled out of the animal snose as any greets at the end of the lower loop tends to tight

Rardware and Toole
SAFETI HORS - T N. HORMSON 37
Stevens St. Astoria L J N Y. This insweston
relates to hooks used in hosticing or handling
articles of considerable weight. An object is so
movide a hook with a physically mounted earlier
safe harmonic of the control of the control of the control
safe article of the control of the control
safe called or other article while locking the color
acts to ploth one as to accommodate the small
size called or other article while locking the color
safes formula. againsi removal

against removal
ROOF JACK —8 DECKER R F D No 2
Lovejov Pa The invention has for its object to
provide a jack cope laily adapted for awinging
saffelds to be arranged upon the comb of the
roof to support a swinging scaffold at the end of a



FRONT VIEW SHOWING JACK AND

hullding the jack is so arranged that it may be adjusted to a roof of any pitch and wharshin carriages are provided for engagements by the support of the saffold the carriages being adjustable toward and from the jack

adjustable toward and from the fack
MIGROMERER A I IPERS — J A Davreisor 807 Courres Ave Indianapolis had. The
object of this inventions the previous or dischermeans in connection with adjustable pressure
controls whereby to obviate further movement of
the registering thimble whose a predeserobied
pressure on the actite being measured has being
reached. The invention provider a handle for
reached. The invention provider a handle for
reached the simble toughter with numes whereby



to a single flask. Another object is to permit casting of rings of different diameters at one oper-ation. A further object is to produce cast as ticle which are exceedingly clean and homogeneous and to dispense with the employment of a skille

CLO III ROLLER —W A ROTHIOLS address Id bind-liman 209 Broadway New York N Y | the invention while capable of wider use is more particularly intended for embediment in is more pasticularly intended for embodiment in the d.t in rollers of spenging machines or like rollers on which the cloth is temporarly wound and from which the coth must be drawn endwise of the roller. The prime object is to provide a roller till may be willdarwan from the cloth roll without any damage so the rich which fro-questly happens at the laterior of the roll when ordinary milers are used

BAN FITTING DEVICE -- G APPROPRI AAW SITTING DEVICE—O Areasson
Oil 10th Are Seattle Wesh Among the
objects of the invention is to provide mean for a
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object of the invention is to provide mean for a
object of the invention in the invention in the
final part of the invention in the
invention in the invention in the
frame of the device with an integral filling size
or in recombination with vorticity adjustable
and in the invention in the vorticity adjustable
and riskilly

Musical Endversaments
DIAHHRAGN FOR TAILING MACHINES

FV Van De Myras 256 W 78th 8t, New
York N Among the principal objects which
the invention has in view are to adapt a diaphraem for vibrating in sympably with a variety
of tone is to avoid unchanical or foreign oversome
in a vibration are count directions to provide a
reproducer avanished with the human voice
and a vibration marketed by climate

and a birector unaffected by elimate Prizes Movers and Their Accessories PRIMING CUP FOR INTERNAL COM-DUTTO PROINING — I. W. McCarenars William of the Company of the Company of the Objects of this invention are, to provide a proper compound when principle an internal embedded company of the company of the provide in the company of the provide man of the company of the provide man of the company of the of crimine's without multiplying the erroriestal descent weed in building the embersor and the company of the company of the provide man of the company of the provide man of the company of the provide man of the company of the company of the provide man of the company of the company of the provide man of the company of the

elements used in britching the engine.

Railways and Their Accessories

AIR HEATER FOR LOCOMOTYPES—C

The internation relates tools betterrive incometives
the other is no provide mechanism for beating
the air and delivering it to the fire box of the engine a surranged that direct draw location and delivering in the box of the engine a surranged that direct draw has be avoided
and, wherein means in provided for admitting cold
affects the fire how when district.

MING USE for the value of the control of the contro

firing of a sectional projectile. An eighest is provide a chance improved with respect he is breach and the elements associated therein to insure the proper teaerwise of the projectile with Sacility, and also with respect to the firing paint trigger, and controlling means.

singure, and controlles means.

TOY AUTOMOBILE AND RAPED PERE
GUN— B BLEEDERARA, 113 ROOM St.,

ROOMINI TENTOR of New Miles

relates to a toy which simulates on armound unsomobile and which is equipped with a regist fregun automatically feel and discharged in vedices
with the proposition of this actionosible, and
with the proposition of the actionosible, are
proportion with the miles of the proposition of the second of the proposition of the

charge of the projectible in single conston.
POLDING HAND SIEB D — B. Thombares,
604 47th 8t. Brooklyn, N. Y. The object of the
invention is to provide a hand sied savenaged to
permit of conveniently extending the ded, for use
or folding it to form a comparatively small,
file bundle, which can be readily certed about
or shipped, or extend without tealing up small
room. The shell is provided with a seat, a back
room. The shell is provided with a seat, a back
room and appraching and lobting device for the

# Pertaining to Vehicles

Portulaling by Vehicles
WIRE SPOKE WHEEL — O. P. B. Horr.
I Glinton Pince, Jamakon, L. I., N. Y. The object
of the invention is to provide a vive gasks when
for use on automobiles, bixycles and other vehicles,
avanged to reache the wheel seasochardy streng,
to permit of conveniently and quickly placing
any one of the spokes in position on the finite and
rim of the wheel and to dispusse entirely with
allipses, noise and like devices.

JACK —J TRAUX, Sycamore, Ohio. The invention relates to jacks for supporting the result wheels of an automobile or motor truck cost of



SIDE VIEW BEOWING JACK IN PLACE

rotatable members which may be driven by a rear wheels of the vehicle to enable the pow of the motor to be used in other work shan driving the vehicle

HEADLIGHT GLARE SHIELD -- D. G KERCHT 35 N 9th St. Allentown, Ps. The invention relates to the headlights of automobiles or other similar vehicles. The object is 30 year-



vide a device in wision the lights is di-wardly so as to Shumbar the read, with being disminished in intensity. As is to provide a device in which means for preventing the place which is of persons approaching the meddles.

We wish to call extension to the face that we in a position to render component earlier every forward of position to render component earlier every forward of position or index sense whether the extension of the component earlier extension to the component earlier extension, temper of the subject-sension to the component angege of the subject-sension earlier extension earlier earlier extension earlier extension e

# Fires cost more than fire prevention

IN America, of all the countries, fire's course is the most destructive. The tax it lays upon each one of us is four times greater than that in European lands (see chart at left). In this there can be no indictment of our own fire-fighters, the admiration of the world. The indictment lies rather upon our ways of building. It lies upon our inflammable roofs, through which fires spread—just as the way to community and personal fire-safety lies unquestionably in Asbestos Roofing, that repels fire, limits it, confines its destructive powers.

Among thoughtful people everywhere Asbestos Roofing is accepted as Nature's best defender against city-wide fire-threat—made great or small, according as each among us gives this fire protection to his own property. Asbestos Roofing is the true Sentinel of Safety to communities, whereever it is used.

"Asbestos" and "Johns-Manville" are words that are almost synonymous today. Just as Asbestos is Nature's greatest protector againstfire, so Johns-Manville is the greates: authority upon Asbestos Roofing. There is a Johns-Manville Asbestos Roofing for every building structure—regardless of its cize or character.

Johns-Manville Asbestos Roofing satisfies every possible roofing requirement. Its use grows greatly. And in the proportion of its growth America's line upon the fire-chart above will be reduced.

# Johns-Manville Asbestos Roofings:

Asbestos Built-Up Roofing; Asbestos Ready Roofing; Corrugated Asbestos Roofing; Colorblende Shingles; Transite Asbestos Shingles,

H. W. JOHNS-MANVILLE CO.

New York City 10 Factories—Branches in 63 Large Cities

Through Asbestos
and its allied products

that hope the host water it belongs CEMENTS that male below wall had proof ROOFINGS

OHNS MANVILLE Serves in Conservation



L. Douglas of that HOLDS ITS SHAPE. \$4.00 \$4.50 \$5.00 \$6.00 \$7.00 & \$8.00

If you have been paying \$10.00 to \$12.00 for fine shoes, a trial will convince you that for style, comfort and service W.I. Douglas \$7.00 and \$8.00 ahoes are equally as good and will give excellent gatafaction. The actual value is determined and the retail price fixed at the factory before W.I. Douglas areas and the setal price is stamped on the bottom. name and the retail price is stamped on the bottom. antee that the shoes are always worth the price "382.8684
paid for them. The retail prices are the same everywhere.
They cost no more in San Francisco than they do in New York.

Stamping the price on every pair of shoes as a protection against high prices and sureasonable profits is only one example of the constant endeavor of W.L. Douglas to protect his customer. The quality of W.L. Douglas product is guaranteed by more than 40 years experience in making fine shoes. The smart styles are the leaders in the fashion canters of America. They are made in a well-equipped factory at Brockton, Mass., by the highest paid, skilled shoemakers under the direction and supervision of experienced men, all working with an honest

ermination to make the best shoes for the price that money can buy, CAUTION—Before you buy be sure W.L.Douglas name and the retail price is stamped on the bottom and the inside top facing. If the stamped price has been mutilated, B E WARE OF FRAUD.

To make by 100 W.L. Douglas stores and gree 5000 Ho Douglas in 100 His Douglas in 100 W.L. Douglas in ordered the form

THE BRIDGLPORT CHAIN CO. MASON'S NEW PAT. WHIP HOIST Specialists in Smell Wire Shapes & Flat Stampings of Courtigree holder. Faster than Skrystors and be some stampings of Courtiers and the stamping of Courtiers and C

BOYS'

13 13.50 4

# PICK, SHOVEL AND PLUCK

Further I rporiences Wit the Man Who Do Things By A Russell Bond 55/281/1nches. Cloth 255 pages 110 illustrations Inchaining 58 page-plates and olered frontispiece \$1.05 postpaid \$1.50

A companion volume to With the Men Wilo Do Lings: taking the same two boys through a new series (fer glint ring set neits e. A fascinating and instructive book for boxs relating how many big things to applicate fig. a second list of the set o

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## The Current Supplement

THERE are a great many industrial operations which call for a deal of scientific knowledge in their successful prosecution, but ordinarily this knowledge have to confined to a single field Every little while however we meet an industrial technique which lies so in the borderland between two or even more, sciences, that it cannot be undertaken without good knowledge of them all. Surh a process is Distriction by Heat in which chemistry, physics and bacteriology all play an important ide. The way in which this comes about is interestingly discussed in an article bearing the above title in the Scientific YUPLIEM) NJ for the current week, Number 2256 for March 29th A British observer writes entertainingly upon Social Wasps and Thur Hays bringing out facts about these insects which will doubtless be new to man readers. The automobilist will read with profit the article Spark Gaps, which it ikes many valuable suggestions regarding the construction and use of these useful little members— The Colloidal Mem branc 1 contribution of value in connec ton with the general theory of osmosus bone what more popular in its appeal is the flustrated second of Tree burgery, with its stumms, cover picture, among others Balarr I hattons from Restricted Sources over r. is subject which is attracting more and more attention in these days when it become plant that we can no longer go on forever cating as much as we want of whatever we happen to fancy. Those interested in aviation will read with interest the description of Experiments with Tan-dem Planes | The Director of the Copenhagen Observatory gives an outline of of (on 1s and the ground upon which they are hand The Biological Character of Fatigue was the subject of a recent investi gation the account of which is abstracted from a foreign source. Other shorter articles of interest are to be found in the issue most important of them being a description of the Tabanuco Gum or Porto

### United States Chemical Warfare Service

(Continued from page \$19)

the Bush River Fxcavation of the foun dations started June 12th, and had it not been for the close of the war, the first been for the close of the war, the first 10 000-kilowatt unit would have been started on December 1st, the second unit on January 1st and the whole power house in all its details would have been complete by February 1st

# The Chlorine Plant

The chlorue plant includes a shop building cell house, rotary converter sub-station and salt-treating buildings Th salt-treating building, measuring 175 ft by 223 ft and 40 ft in height, involved beavy concrete work, both in the tank foun lations and in the salt-treating tanks. There is also an extremely intricate system. a mert is also an extremely intricate system of piping counceting the tanks and the centrifugal pumps for handling the brine We precipit an excilient view of the interior of one of the cell rooms. The cell used is known as the Nelson cell. Current for the operation of the cell building was brought by a high-tension transmission line, which was built across country to intersect The current is led to a rotary converter sub-station, and thence to the cell room

On July 15th, the chlorino plant was ready to deliver 2½ tons of gas daily to the chemical plant, and the rapidity of the work will be understood when we state that the site of the plant was selected only on March 27th, and in less than four months from that date it was ready to produce gas and deliver it by pipe line to a point about 2,500 feet distant from the place of production

## Mustard Gas

Of all the gases used by the Germans,

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### Recent Patent Invention (Contan sed fr m page 122)

tion and while the meaning of that document can be illustrated by the solicitor s arguments or the patenters admissions which are part of the file wrapper contents a copy of an advertising publication sub-mitted to the examiner before the patent was issued cannot be coundered as evidence of the basis for the grant of the patent Every claim represents a separate cause of action, and cannot be helped by other good claims but must stand on the disclosure as interprited and measured by the prior art. The Stumpf patent therefore for an improvement in steam engines relating to the heating of the steam within the cylinder near the inlet port by maintaining live steam in the cylinder head held walld

live steam in the cylinder head held valid and infringed — bituspit; 4 Secretar Brg Co U S ( C A of N ) Concealment of an Invention—If to the rule that no patent may validly issue for anything known or used in the country before its invention by the pat enter there is an exception that wh inventor conceals or suppresses knowledge of the invention, his claim is subordinate to that of a subsequent bons-fide inventor of the same device, such exception must be confined within narrow bounds. The first inventor must have determined to practice his invention secretly and his afforts to keep the invention secret must eacris to keep the invention scores must have been successful. An inventor who makes up his mind not to patent his in vintion or not to patent it until he thinks someone else is about to invade his mon opoly forferts all right to a patent —The h W Bliss Co \* bo dhers (an Co U S W Blues (o v So thern (an Co D ( of Md

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General Office 28 Richards Street Brooklyn, N Y wholes Formerly it was possible to affect tion of fa only by converting the radiant energy estima is ingute host Satisfactory shough in some character assensetions, this impation was, in others, in colors a source of mannyeniance and error Ac aordingly the Bureau of Standards has for cordingly the Bureau of Standards has for 10 years or more been pursuing the subject, with a view to establishing standard procedures of a definite character, and in a recent summary of the week to date, published by the Bureau under the title Scientifi Paper No 219 some very in-teresting results are disclosed

seresting results are theoresed. In the radiant cargy is absorbed by a blackened receiver and converted tall to heat, which is then measured in various ways. In the Nichola radiometer, the absorbing members are vance supponded in partial vacuum, and the boorbed energy affects the molecular a tion of the gas remaining in the chamb r sufficiently to cause a reaction in the form of a rotation of the vanes. In the thermopule the thermocouple is used, depending upon the fact that when the runction if two different metals is heated. punction if two different messais is faster, an electric current is set up. For the purpose before us, the heating is here done by the heat generated from the absorbed energy and the resulting current is measure i by a galvanometer Still another type is the Langley belometer, in which the city of presence of a metallic makes it is the control of the which the electrical resistance of a metallic strip is changed under the influence of the all of these successful devices, measu ment of radiant energy has been attempted on a basis of the expansion caused when it m shearhed by a gas or a motal and con-verted into heat but this procedure does not aff rd sufficient accuracy to be considered scrously

The outstanding feature of all these m-stallations lines in their mability to pick out a frum of radiant energy of a partout a run or radian energy of a particular wave length or even all trains within a given rage. The rays which have so far been measured vary in length from 000001 inch in the extreme ultra-violet to 01; for the longest infra-red rays yet isolated. The absorption radiometer re-acts indifferently to stimuli throughoutth is range The several types vary only in speed if it requires two seconds obtain a galvanometer reading, the thermo pile will take three or four seconds, and the vane device may need as much as four or five minutes

Now this universal sensitivity may well Now this universal sensityry may wail be an advantage in cases where we wish to measure the total intensity of a highly complex beam buch a measurement plainly could not be made with a single instrument of restricted range But instrument or restricted range for the other hand if what we want is to detect the presence and measure the intensity of certain wave lengths the non-selective apparatus is worthless. We must device an instrument which will react only to th lengths with which we have to do
in privious communications, the Bureau
has directed its attention principally to the non-selective and selective types, findthe nn-selective and selective types, unding these of wider application than nativa-ments which respond only to certain frequencies wheth respond only to certain frequencies whether visible or not. But it has been found desirable to turn now to the other kind, and the report which we here summaries records the efforts made to develop a satisfactory selective indicate.

tion of the energy in stan-come of the substance of characteristic material has a in resistance for radiotion lengths which are least about ugus wron ere best absorbed Unfortunately, inverter, the

cell and its commen are not well the purpose in band. The set depends upon host treatment, an not only with the ways-length attraulus but also with the indense depends upon heat bestiment, and sugins, not only wish the wave-length, of lives attrautus but also with the interaction, and in the control of the control

vacet and ultra-violet When thus used they are designated photo-electric cells The photo-electric cell coems to become fatigued, and its The photo-electric cell ceess to become fatygued, and its response a not directly proportional to the intensity of the stimulus but unlike selensium, this lack of prapartionality does not depend at all upon the wave-langth. This device accordingly appears to meet the requirements of a quantitative radiometer. It may be sfectively used for measuring ratios of intensities extending from the bite throughout the ultra-voice part of the spectrum under this investigation should apply to the Bureau of Standards for Scientific Paper No. 378, the price of which is 10 cents

# Air Serooms for Furnace Workers

AN account was recently given in a C German stechnical paper of the intent methods remployed in Germany for estreac-ing furnaces. Workers tending farmission, and required the examine the gloreling inst-terial at frequent intervals, aftered a given deal from the excessive heat endistaid, and are considered to the contraction of the concent from the accessive terms actions were accessed to intelligence for the condet furnace doors have been free obclossity they afforded particularly white closed Again, devices have installed for drawing all the lot are in Perhaps the first thing that would occur within elected Aguin, devices have possessed to an investigator in this field is that the interest the property secretary and the latest the product of the possessed that the product of the possessed that the property secretaries of the later, would afford a fine posses of the later, would afford a fine possessed that the property secretaries is discontinuously behalf and objection to these is this very use attack. The property secretaries is very secretaries and the possessed of the property secretaries that of decreasing electrical restart and the property secretaries and ultra-volve portions of the easts. It is also also the property secretaries and the property property of the easts. It is also as a secretaries and the property of the property the p

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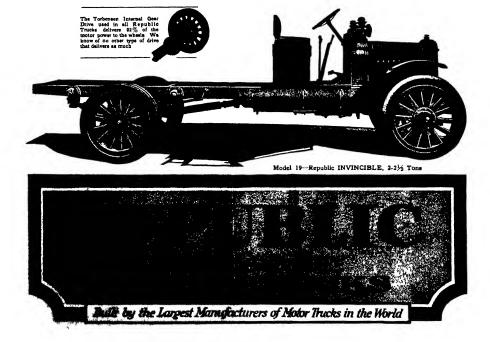
Developed from a careful study of the needs of motor transportation in every industry and binder exery road load and climate condition encountered in the 27 countries in which the "Yellow Chassins Trucks have served so well

In basic design these improved Republic models adhere to Republic practice which has amply proved its correctness through five years of constantly increasing public confidence But many improvements have been made to give increased service and value

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More than 1400 Republic Service Stations insure continuously satisfactory service to every Republic user.

REPUBLIC MOTOR TRUCK CO, INC, ALMA, MICH





# SCIENTIFIC AMERICAN



# WILL YOUR MOTOR TRUCK BE AN ORPHAN?

THERE are thousands of truck orphans left on the hands of their owners. Their makers have gone out of business. It is reported that, of 555 companies organized since 1909, 331 no longer exist. Half of the remaining are less than two years old. 228 lasted but a year.

Making motor trucks is a large scale operation. Only the resourceful succeed. Some makers lack the capital. Some lack the output for economical manufacture.

Motor trucks are an investment. Rightly used, they should earn dividends large enough and long enough to write themselves off the books and then make a clear profit. The investor in a bond is as keenly interested in the soundness and stability of the issuer as he is in the terms of the bond. So the purchaser of a truck should be interested in the permanence and stability of the maker.

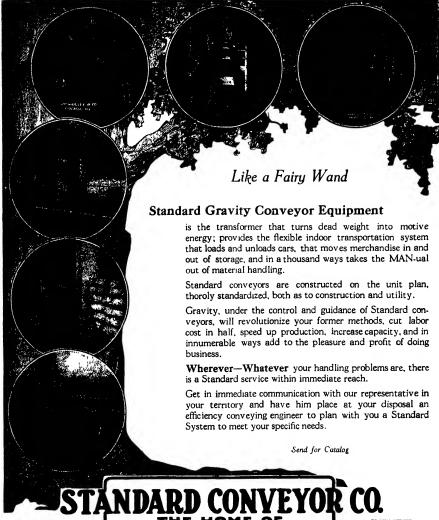
Any mechanism designed to last is

a doubtful value if the maker can not be counted on to remain in business and back up his product. The purchaser invests also in the maker's experience, in his reputation and in his service facilities. Of what use is a truck if parts are no longer available? What resale value does it have without a maker? Who will furnish service to the owner?

A purchaser can judge these things by: Years in business, Financial statements, Performance records, Number of trucks in service, Size and growth of output, Reputation of the product, Service facilities already established.

The Purchaser of a White Truck Backs His Investment in It with the Strength of The White Company, with Its Years of Successful Experience, with Its Thousands of I Trucks In Active Service, with Its Millions of Capital, and a Service Organization, Nation-Wide, which Has No Parallel in the Industry.

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Which is Better Business? \$4,000 for 100,000 Miles or \$3,000 for 50,000 Miles?



ROFESSIONAL appraisers say that the usual rules for writing off depreciation do not apply to the average motor truck.

Their experience shows that in many cases the truck is discarded before its value is covered. In others the maker goes out of business, and parts are hard to obtain. Out of 109 truck builders listed in 1911 less than a dozen and a half are in business today.

Packard depreciation is a known quantity. It is written off at the same rate as that of any fine machinery.

The low rate of Packard depreciation is responsible for the remarkable resale values of Packard Trucks.

There is always a market for a Packard.

The stability of the house is partly responsible for this condition — Packard parts for every model made are always available and at fair prices.

Packard design and engineering is chiefly responsible.

Which is better business?

To divide up \$4,000 original invest-

ment among 100,000 miles of service—or \$3,000 investment among only 50,000 miles of service?

Original cost of a truck means nothing except in percentage of total transportation cost.

The original cost of a Packard figures out probably a lower percentage than any other truck on the market.

And how can a truck that cannot show 100,000 miles of service try comparisons with a Packard!

Which is better at the end of three years? To have a utility value of two-thirds what you paid for each truck—or to have merely scrap value?

Let a business man buy efficient freight transportation and he buys an asset to his business. But if he buys a motor truck unrelated to the best uses he can put it to, he buys a liability.

Freight transportation economy is gained by using trucks of the proper capacity and built for long life. The most expensive part of motor trucking service is the thousand dollars somebody tries to save at the start.

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# THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX |

NEW YORK APRIL 5 1919

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Diagram showing the Roosevelt Tunnel and the Cripple Creek mines that it drains

## The Roosevelt Deep Drainage Tunnel Finished By C Bond Harpole

THE Roosevelt Deep Drainage Tunnel in the Cripple Creek, Colo, gold mining district one of the longest and most hasardous engineering feats of its kind ever attempted, has been completed after 11

attempted, has been completed after 11 years of panistaking effort and tremendous cort. The tunnel us one of the longest mining tunnels in the world, the total length from portal to breast being 24 355 feet, or approximately 46 miles In January, 1918, the total water-discharge at the portal was about 4,000 gallons per minute, but it steadily declined and now infowing about 2,000 gallons a minute The maximum discharge was 17 000 per ainute, this coming in the early part of aniute, this coming in the early part of ane maximum discharge was 17 000 per minute, this coming in the early part of 1916. The tunnel cost nearly \$815 000, the average cost per lineal foot being \$32.30.

833.50 The year 1906 operators in the Crupple Creek gold-mining district found that ore bodies on the upper levels were fast being exhausted and that they must start more development work There naturally was only one course to take and that was to aink their shalts deeper which they did The Portland Gold Mining they did The Portland Gold Mining Company was one of the first to start car-temative development work of this kind but the engineers, after sinking the shaft to 1,200 feet, began to encounter a great deal of water, which seriously hampered operations Pumps were matalled but it was quite evident that a more satisfactory d of draining the mines had to be invented or development work could not go forward unhindered

forward unhindered
So it was that the Rocewell Deep
Dramage Tunnel had its birth In 1907
Albert E Carlton, enganers and practical
sines, organised a tunnel corporation
among the preducing companies and made
the huge bow possible Carlton cuttined
a plan for driving a drainage tunnel to
connect with the principal indice of the
distents and to furnish an outlet for the

underlying bodies of water. In the legiming reputable mining engineers acoffel at he plans delaring his scheme was impractical but the remarks dil not dampen his outhusiasm and to the source of the soffers are aiding in development work in the low levels of mines unwatered by the tun I that before mayor could



The pertal of the tunnel, showing the delivery of water

have ben operated. Carlton not only took the first contract first ring, the worl lat put up a considerable portion of the funds and continued to do so until it was emplet 1

implet 1

The first pr blom was to find a suitable portal—one
that would furnish the direct depth and at the ame
in provide for a new of about three feet
port thousand. In view of the fact that the
port thousand in view of the fact that the
port thousand in view of the fact that the
is would have to serve as a drainage bore
for all time to come this feat was doubly
defit ult. The point finally selected for
the point is not rapple Crick guide about
for miles southward of the town of Cripple
Crick. It is not an elevation of 803 feet.

over miss southward of the cown of crippies (Creek I is at an elevation of 8 033 feet above soa level Actual work on the tunnel was started in Jun 1907 and the affair was a holiday in the Crippic Creek gold eamp James Peabody then Governor of Colorado, better a buttle of themselve a buttle of the common serves the Peabody then Governor of Colorado, broke a bottle of champagne across the bore s portal naming it in honor of the late Theodore Rossevelt, who then was Press dent of the United States

The work of draving the tunnel was most discouraging at times and it was difficult to get immers to handle the drills owing to extreme hardness of the rock formations Much of the distance was driven through what is known as Pike's Peak Gramte's a brucen formation known to mining engineers in the West for its toughness were days when progress was extremely slow and the machine men were unable slow and the machine man were unable to break more than one or two feet of ground in 18 hours. Three shifts were employed during much of the time the tunnel was under construction. The reatest single day's progress was about 12 feet This will give some idea of the territory being expliited. The main bore for nearly its entire distance is eight to 10 feet wide and seven feet high. A waterway is provided at one side that is four feet wide and three feet deep

The Roosevelt tunnel has lowered the general underground water level in the (Continued on page 158)

# SCIENTIFIC AMERICAN

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Charles Allen Munn President Orson D Munn Treasurer Allan C Hoffman Se relary all at 21t Br alway

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The object of the sound as to recard up unitely and luridly the litest ecsentific me hinical and industrial news of the day to a neithly journal it is in a poet announce interesting level i merts before they are published elsewhere

The Fastor is glad to have submitted to him timely articles suitable for these clumes especially when such articles are accumpanie (1/1) t graphs

## The History of the War

HO will write the history of the late war? Histories of course will be written by the score by the hundred but who will produce the one great chronicle writing with such an authorita tive and impartial non-that men shall accept the record as conclusive and final If such authority can be found much controversy will be saved -and the writing of many and uscloss books. We doubt if any field of literary dispute has been so fruitful of fruitless discussions as that of military history and in saying this we do not except even the theologians

The great work abould be undertaken at once for every years delay serves to obliterate the record | I des may be mislaid personal note books lost or thrown aside in thoughtless disregard of their worth the older men who directed the war do off the younger men who fought in subordinate command or in the ranks return to civil life and become scattered to the four curners of

The demand for a highly authentic history is far more pressing today than it was at the close of any previous war of importance for the colossal magnitude of the thing whether it be measured in terms of men materials or geographically in terms of its far-fluin operations will render the task of collecting arranging and recording the data in their proper sequence one of extraordinary difficulty

Hitherto, such tasks have too often fallen to a layman, who made up or attempted to make up for his lack of military judgment by a display of his literary gifts More often than not the historian has been swayed by an uncontrolable bias forgetting that it should be his first care to exercise that impartiality in the presentation of his facts which characterizes a judge's charge to the The mevitable result is to start a controversy that may descend to the third and fourth generation

Consider the 1huty Years War of which so many labored histories have been written. The best known of these were the output of man who were either Catholic or Protestant such as lauseen and the violent partisanship of their authors breathes in every chapter and vitiates the value of the work as impurish and illumi nating history Or reflect for a moment on the eternal controversy that has raged around the question. Who won the Battle of Waterloo? The British will tell you that it was the dogged persistence of the British infantry formed in squares to withstand the furious Cuirassiers of Napoleon Victor Hugo says it was a shower of rain and a sunken road. The Germans, well of course, her won it they are getting ready to tell us that they won this war morally psychologically or in some way or other At any rate unless the plan we are about to suggest be followed it is quite possible that the children of future German generations will be taught that the whole world consumed to crush Germany and that after vainly trying to do at for four and a half years, in which they never set foot on German soil they were so worn down and discouraged that they gladly accepted the German suggestion for an armistice

We suggest that with a view to having the military facts presented to the world in a history of such high authority as shall silence all doubt and shut out useless controversy, the Peace Conference arrange for the General Staff of all the Entente nations to collaborate in compiling a history of the Great War from the first clash of armies in Belgium to the glorious consummation on November 11th 1918 The Cerman and Austrian Staffs should be invited to contribute the history of the operations from their own side of the battlehne As Ldstor of this work no better man could be found than Foeh War College Professor Chief of Staff and Commander in Chief of the Allied forces

Here we would have an ideal war history -a source book upon which individual national historians could base any works they might feel disposed to write If a nation felt that it was entitled to say. We won the war. ht its historian go to it. The book of Truth would be there before him with its lists of total expenditure total enlistment total wounded and total dead. He could turn to the record of battles won and lost of total front held and finally of the total months spent by the several nations fighting on the various fronts. This sort of literature is inevitable but in view of its inevitableness, let us have the one great, official unbiassed story told by a composite group of the Allied Staff officers who alone know the whole truth and are sworn when they speak, to tell nothing but the truth

# The Trans-Atlantic Flight

ACH were no control train-Atlantic flight control Already are well over a half-dozen recognized parameter well over a half-dozen recognized parameter well over a realized to announce their ACH week brings forth new entries in the great ticipants and many more are about to announce their entry in the greatest competition in aviation history In fact the trans-Atlantic flight is rapidly becoming a race for there can be little doubt that several participants will succeed in making the crossing within the next few

To those intimately familiar with recent progress in iviation it is somewhat surprising that the trans-Atlantic flight has not yet been achieved From day to day an autouncement of the fest has been expected and it was with little surprise that aeronautical men read of the rumored start of a French (audron from Dakar on its way over to Pernambuco in Brazil via Cape Verde Islands and St Paul Rocks But upon looking up the status of St Paul Rocks in the atlas it soon became evident that the intropid French pilot would have a difficult time locating these maignificant bits of land in the wide expanse of the southern Atlantic, unless little short of a tape line had been laid acros the water to guide him on his way. However, the rumor proved to be more or less unfounded, although it is known that the French airmen have been considering this route because of its short jumps

It would seem that, given refucing facilities at sea, any one of the large seaplanes now available in the United States and Great Britain could long ago have made the trans-Atlantic crossing But when a non-stop flight is considered, the problem becomes considerably more difficult, and many of the existing airplanes with flight ranges of 1,000 or 1,200 miles are eliminated. In truth there are very few planes immediately ready for a non-stop flight of about 2,000 miles which is the distance of the trans-Atlantic crossing from Newfoundland to Ireland allowing for such drift as may be encountered in aerial navigation over such a course

The British have several dirigibles of great cruising range available for the flight. It would seem that the dirigibles might easily have crossed the Atlantic within the past month or two, since in thights over the North Sea at least one of them has covered 1 420 miles without landing Another British dirigible has cruised for almost a week without alighting. The latest and largest Butish dirigibles, the R-15 and the R-34, are now ready for the great flight, with a competent crew of officers and men formerly in the Royal Navy Quite n cently these airships have been crusing over the Atlantic instead of the North Sea, and it would be quite sample matter for the pilot of one of them, finding the weather and conditions ideal to continue an experimental flight westward until he touched some point of North America Thus the flight would be achieved without previous announcement and without extensive preparations such as are almost certain to mark any attempt with a heavior-than-air machine. So it is that aviation men have momentarily expected to hear of a British dirigible landing in Nova Scotia or Newfoundland after a successful erossing

At any rate, the trans-Atlantic flight is now being approached in all earnestness. There is Captain Sunstedt with his graceful scaplane, the British with the Sopwith two-scater to be prioted by Harry Hawker and seut -Com McKensie Grieve, and the Porte triplane, the Americans with the Model T flying boat which carries five Liberty motors and has a cruising range well over 2,000 miles, the French with their Caudron which has a range well over 1,200 miles, making it eligible for the shorter southern routs the Italians with their Capronis which, it is understood are being rushed for the competition, and many others not yet antiounced Some time in April ought to mark the first flight across the Atlantic, with either the British or Americans as the most likely winners of the London Dauly Mau prize of \$50,000

# Scaplanes for Fishing and Oceanography

TARIOUS interesting suggestions are cropping up in response to the pressing question What m to be found for the vast fleet of aircraft acquired during the war by the recently belligerent governments? One of the latest comes from Professor Joubin of the Oceanographic Institute in Monaco

An important business of the scaplane during the war was hunting submarines As is well known, a submarine, when not too deeply submerged, is easily seen silhouetted against the sea-bottom from a point of vantage a certain distance above the water The same is true of the larger species of fish A good-sized mullet, for instance, can be seen from an altitude of two or three hundred feet, when swimming over a sandy bottom. While smaller fishes cannot be discovered in the same way when separate, they are readily seen when swimming in shoals is the habit of so many valuable food species, such as the sardine, herring, etc.

Professor Joubin proposes the establishment of a regular patrol by hydroplanes over the various fishing grounds These craft should be equipped with radioelegraphic apparatus, whereby they would notify the fishermen of the neighborhood whenever a shoal of fish, was located This plan would result in a great saving of the fishermen s time. It would also ensure a more eronomical use of expensive bait, such as the peanut flour and fish roe, used in sardine fishing

A moving shoul of sardines several feet below the surface (and this is also true of various other important species) is distinguished by a characteristic glitter, due to the reflection of light from the fishes scales An observer fiving at a moderate altitude could easily detect this appearance. The tunny of the Bay of Biscay feeds on a certain crustacean, Ruther sale bispinosa, which lives in immense swarms, coloring the sea rod over wide areas. As these red patches, which be-token the presence of a school of tunny, are easily seen from the fishermen's boats they could doubtless be located even more readily from a seaplane It is suggested that the tunny fishers would do well to aband their sailboats for motor-boats, equipped with refrigerating apparatus Ahead of the fleet of fishing boats, when it puts out to sea, should go a few serial scouts, whose observations would promptly determine the whereabouts of the tunny and its favorite food
The sperm-whale fishery, as carried on in the Asores,

may be mentioned as an industry that would profit immensely by the use of airplanes The whalers maintain observation posts in these islands on the summits of high cliffs, at which sometimes months go by without a single whale being sighted The advantage of substituting the airplane for the fixed station on shore is obvious

There are also many kinds of hydrographic and oceano graphic research that could be carried out to advantage by means of suitable aircraft M Joubin has pointed out that, in clear weather, and regardless of whether the sea is smooth or otherwise, it is easy to observe the character of the ocean bed at moderate depths Differences in color serve to distinguish mud from sand, gravel from rock, etc , as well as the characteristic algal vegetation Seaplanes might well be used for mapping these features, in the interest of the fisheries, the seaweed industry, etc Photography could doubtless be present into service to facilitate such an undertaking, and various adaptations could be made in the aircraft to fit them for the special work in hand, such as the installation of a telescope in the bottom of the machine to reveal im-

Professor Joubin is a veteran student of the sea, and his suggestions are worthy of serious consideration.

## Naval and Military

French Get a 75-Mile Gun — A dupatch from Paris states that the Germans have agreed to hand over to the French one of the 75-mile guns which bombarded Paris Following to transfer, the French authorities will done less publish full particulars of this much-advertused waspon, and we shall know whether it was a new design from the ground up, or whether it consisted of a 50ciliber, naval, 15-mch gun with a liner reducing the caliber to 82.

We Need Fast Armored Ships—It is to be hoped that the decision of the Government to postpone the building of the six battle-crusers will be followed by an aarty decision to build something in their place that will combine high speed, great gun power and good protection. As mattern now stand our navy has nothing that could catch the battle-crusers of some of the foreum powers. A decision on this subject should be made at the earliest possible moment and construction runked on the new ships

Cavalry Not Out of Date —That cavalry us still a necessary and important branch of the army is emphasized by the Army and Newy Journal which quotes an officer of the General Staff, an authority on the cavalry arm, to this effect. He has pointed out that until the arplane can be used as a means of rushing forward resinforcements and for reconnaissance at night it cannot supersede the cavalry. Reference was also made to the signal success stained by General Allenby against the Turks in Palestine which is attributed largely to his evalry action.

Changing the "Troy" to a Troopship—One of the largest purely freight ships in existence is different purely freight ships in existence is different purely freight ships and the state of the Allanie Transportation Line Her beam is 75 feet and she is between 600 and 700 feet in length. The vessel is now at the Hetcher Yards in Hoboken where she is being converted into a troop-carrying ship. The work is said to involve the construction of 10 000 hunks. I has great number is possible only if the whole of the space on the various decks as devoted to troop carrying. The vessel is controlled by the United States Shipning Soard

Compensation for Builders of Wooden Ships—
We are pleased to learn that the Intel States Shipping
Board will protect the wooden shipbuilding companies of
of the country from losses which are due not to their
own fault, but to the eugencies of the war situation. A large number of enterprising men responded to the call alarge number of enterprising men responded to the call alarge number of surface production and a great number of yards were land down. This work was undertaken in perfectly good faith and it is only just that the Covernment should make a careful examination of the lawful which put whole-souled effort into the task of the surface of the companies which put whole-souled effort into the task of building ships, be permitted to suffer the serious financial loss with which many of them are threatened

Cost of Relining a Gun —Froston promises to be the bide not of the artillerist for many years to come or at least until that happy day arrives when somebody and all that happy day arrives when somebody on temperature. However, the problem has been considerably seaded of late years by the practice of relining, saderably seader that a relined gun is practically a new gun. We understand that a jet-ined gun is practically a new gun. We understand that a jet-ined gun is practically a series of the series o

Sime Urges Rigid Airships — dimiral Sims has recently sent a measage to the Navy Department in which he says 'I say thoroughly convined from my observation of the naval lessons of the save that me future rigid simblings will be a part of the fleet of every first-rate power.' He verifies the statement which has already appeared in the press that England has a number of large sizehigh sultit and building, some of the new ones to be 965 feet long and of 2,700,000 cubic feet respectly with a maximum speed of 59 knots a crusing speed of 38 knots and endurance of more than 200 hours. He states that the Admiralty is planning this summer for a flight to the United States and back with one of the British rigid sirehips

## Science

Insects in Amber—The proverbual fly in amber a strikingly exemplified in a collection of red amber from Burna recently pressited to the British Museum by Mr. R. C. J Swinhos of Mandalay. The amber is unusually red in meets including according to Prof. T. D. A. Cockerell who has examined the material 31 mes spices of which five are type of new genera. Most of these are found in a 11 ck of amber rather larger than a man 8 fat. This has been ut into shees about half an nich thick. Nearly except large order of meet is represented with the except large order of meet.

Sterilization of Criminals and Defectives Intromittee on Cacegame Introl of the Fugurier Rossarch Association, of which Mr Bisrecker Van Wagenn is chairman and Dr II II Jaughlin scientary has recently secured and six III Jaughlin scientary than recently secured and six titled the case instorate of 777 persons who were strilized under the several capital venightet record of au h perstations legally per formed. The committee has also secured and au notated for publication rice rds I the new sterilization laws of lows. Nebraske Cash Train Oregin Kanassa and South Dakota and has compile I are united of the hitigation growing out of the sterilization has so I convince states.

Infant Welfare in Germany An official report recently published in England Ic ding at length with the condition of children in Germany during the war states that about 40 per cent fewer babies were born in 1916 than in 1913 The first thre years of the war reduced by over 2 000 000 the number of babies who would have been born if peace had prevail d In the early days of the war infant welfare work was somewhat neglected but eventually this work was a tively taken up tary societies took an important part in it but the tend ency has been for the movement t lecome more and more municipal The infantile death rate has been kept well down The encouragement of breast-feeding by means of government allows a cabas been regarded in Germany as one of the most officially methods of promoting infant welfare

Mental Hydlene as a Public Health Problem The II & Public Health Service has adopted an autobitious program of undertakings with respect to mental hygiene a subject which his hithert; received insuficient recognition as a pul li health problem. Among the many enterprises projected are the establishment of a school for training medical officers connected with the immigration service in mental hygiene and providing corresponding special instruction for nurses and assistauts cooperation in the ment il examination of coastwise pilots locomotive engineers and train despatchers as a safeguard to the traveling public aid in devising mental tests for civil employees of the Government to determine their fitness for diffirent occupations aid in the study and prevention of meanity and mental deficiency among the Indians I squimaix and other primitive races for whose welfare the Covernment is responsible cooperation with the Bureau of I ducation in problems relating to the training of feeble ininded and delinquent children and a wid range of other useful activities

Science at a Prison Camp Apropos of the un timely death of Dr A F 1e hmere a correspondent of Nature writes of the unique scientific work carried or by that English biologist during his internment at Rublet n Germany He was especially active in building up he natural science laboratories originally installed in the hay-loft and the horse-boxes of the most ramphael e stable in the camp. The history of these remark it claboratories reached a climax on the oc asion of the Natural Sciences Exhibition when the laboratories were thrown open to the general public of the camp besides receiving the patronage of the commanding officer and his staff. The writer states that one could occupy several hours profitably in passing through and observing the various exhibits and the experiments being carried The biology laboratory Dr Lechmere's favorite haunt was equipped with a first-class microtome stock of fine microscopes excellent electrically regulated thermostate etc During his four years at Ruhlebon Dr Lechmere delivered many popular lectures on biological subjects to large audiences of his fellow-prisoners generally illustrated with lantern-slides made by himself at Rubleben

### Electricity

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Locating Ore Deposits—It is understood that Prof R A Fessanden of Boston Mass has developed an ingenious electrical and sound wave system for detecting hidden ore deposits

Submarine Signals During the war as a well known submarine sun legg using has made great strides. In Notiffle is an act, into given of a device comploved in Corman. In this devict the receiver the sequence of the outer layer of the slope shall for missale and is filled with water, the long of the ground the outer platting of the viewel. He essential point in this device algorithm of the device platting of the viewel. It is essential point in this device algorithm of the device platting of the viewel. It is essential point in this device algorithm of the device has a most cases the sounding device has a finished by the device has been deviced by the de

Electric Soldering Device \ \ novel soldering device for hight soldering work in which the metal to be soldered is heate i dire the by an electric are established between two eart on points has been developed by H. Hendricks of Detruit Mich Clusing the tool brings the solder into ontact with the electrides. The device is designed to be attached to a six volt storage battery but can of course be used on ordinary lighting voltages in conncets n with a step-down transformer. As pointed out ty Mr Hendricks all of the heat is applied directly at the p int where it is needed and only during the time necessary for soldering so that about one tenth of the energy consumed by other soldering irons of equivalent capacity is required. The device is always ready and the workman does not have to wait to heat up the tool before making use of it. It is of light and simple construction and the way in which the solder is fed makes for the greatest economy in the use of soldering material

Flectric Meters for Street Cars - The Electric Railway Journal gives some instances of the utility of meters on street cars with a view to checking waste of energy Some comparative tests made with the same comment on kyel lines and gradients show that as much as 26 per cent saving in energy could be made in this way Originally 2 093 kilowatt-hours per car-mile was obtained in a test in which the dials of all meters were kept covered so that the driver could not obtain any information as to the current he was taking Suh sequently after a period of training in which instruction was given on the handling of cars by observations of meter readings an energy saving of 0 253 kilowatt hour per car-mile (about 12 per cent) was obtained in spite of the fact that clumatic renditions were less favorable than in the first trials. On very severe hilly routes it was eventually found that the energy consumption could be reduced from 341 kilowatt-hours to 252 kilowatt-hours per car-mile-a saving of 26 1 per cent mainly due to better handling of controllers and brake eaupment

A New Device called a hospital call switch has just been developed by a large electrical manufacturer in Milwaukee It is made for installation in a standard switch outlet box and the wiring for it does not extend beyond the box. No flexible conductors or pendent switches are required for its use and consequently the annayance of having these parts worn or broken is elimmated. It is so constructed that the patient can only complete the circuit to signal the nurse and the nurse can push it off only at the bedside. Lurther as the live parts terminate in the wall there is no possi bility of the patient coming in cutset with them Therefore it has none fithe bjectic nable features generally present in such systems and is a means of making nester and cheaper installation. A pull chain to which a linen cord is attached is used to pull the switch on The push button I cated above the horn through which the pull chain extends is used by the nurse to push the switch off In a ward where two or more switches are used on the same signal the protruding button indicates to the nurse which patient The signal remains on therefore until the nurse comes to the bid to much the switch off The plate is the same size as those used for electric light wall switches and receptacles. The new device may be used on any standard lighting circuit of 125 volts or less

# The Prevention and Cure of Hookworm

Causes and Extent of the Infection, and How It Is Being Stamped Out

This brought to our attention by a local correspondent that as the result of examination of 15 000 persons in the coastal regions of tropical Queensland, for Waite the Rockefeller Institute has found over 20 per cent of the white population and fr in 7a to 95 per cent of the aboriginals to be infected with the hookworm parasite The Rockefeller Institute has offered to cooperate in the The too sector institute has one rot to cooperate in the eradication of the earl which is now confined to a small portion of Australia but which will probably apreal widely of not taken in hourd. So far however, nother the Queensland State nor the televial Covernment has manifested any willingness to bear the necessary ex-

manifested any withington to their its interestinated the whole is refused in not peruliar 1: one section of the world. If our out's 1, attribut 1: the presented lack of understanding in the len interest in the peruliar lettering of the mindry in questin. The pupilar lettering of opinion is not definitely a unif in 1. In the ordinary acute epidemic discusses there is in element of the popular managination. The patient is well to his sick in bed tomorrow the disease has its very visible mainf stations, which run for a more or less of finite period, the patient either dies or gets well. But hol worm disease is like tuberculous, only more so. There is nothing of the spectacular in it it is not active but chrom—the patrial runs down so. gradually that he fuls to a dize that he is sick he merely confesses to not feeling will a very large distinction to

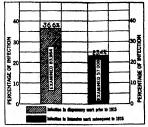
any save an actual student of medicine. There is 10 definite onset no sudden prostration to suddenly ar quired symptoms even. He nationt is just run down of much difficulty to conthought and action that here is a definite disease and a serious disease—a disease moreover that is communicable—yet a discuss that is amountly to specific treat ment, and worthy of such

The hookworm disease is one whose method of communication is even more roundabout than that of bulsonic plague. It is caused by a small parasitic worm Unimaria, about as thick as an ordinary pin and about half as long Thousands of thalf as long Thousands of these may live in the intestine of a single person in one case more than 6,000 were passed as the result of treatment. While the female produces as many as 2,000

eggs per day these never mature within the host but only after leaving the body in the facces. Under proper conditions of air, heat and moisture they then hatch within the brief space of from 24 to 40 hours Once hatched the larvae too small to be seen with the usked (ye may live on and near the surface of the ground for

many months, in a state of more or less arrested develon ment and so long as they thus remain in the soil they thus remain in the soil they retain their microscopic size. They get back into the body of a fresh host by boring through the skin of the bare hands or feet or any other ports m of the body that may come in centact with the soil

Having thus centered the human cream no they have yet t d me traveling before they me able t develop in 11 meanicus to health. After foring to health Aft r lorn g the lymphatics is cirrical through the beart in the ordinary course of circult tuon, penetrate the lung and finally reach the throat finally reach the throat where they are swallowed,



Percentages showing reduction of hookworm infection

in the ordinary course of events they then proceed to the small intestine. Here they remain at l gr w to maturity to carry out the last stage of their life evels. Unless disturbed by treatment, the individual worms live for seven years or more in this, their final home, nourish-



A Ceylonese girl before and after treatment

Two Tobago boys of same age, one at left heavily infected with hookworm

ing themselves by sucking the blood of their host. It is an open question whether in addition to this action, the worms cause changes in this blood which tend to destroy the hemoglobin. Whitever the process, severe infections are followed by a vere anemia



The world-wide distribution of the hookworm infection

dran who develop the diseases are stunted physically and mentally, and in extreme cases practically unsexed. While the hook worm anomal send disesty to deash only in a few extreme case, persons harboring the infection are, naturally, more susceptible to such makeles as makeria, typhoid, pneumonas and tuberculosis. Becommonally, perhaps its most errous effect less in the great loss of individual working efficiency. Even where it is not especially severe, it results on the contract of the co than even thus

For the very reason, as already pointed out, that it is not spectacular, hookworm disease is the greater menses. Acute diseases not seldom tend to strengthen the race by killing off the weak, but this infection, working so insidiously as frequently to escape the attention even of its victims, tends rather to debilitate the race by attacking the strong as well as the weak The cumulative effects of the disease on the race—physical, economic, intellectual, and moral—which are handed down from generation to generation, through long periods of time are even more important than its direct and indirect contribution to the death roll among individuals. This one disease, when infection becomes general, may go far toward explaining the retardation of backward peoples.

waru explaining the retardation of backward peoples. Hookworms were first discovered in 1838, in the body a peasant woman at Milan There is no doubt that

for centuries before this they had been prevalent as a distressing and disabling factor among the nhabitarie of tropted and sub-tropted countries between the parallel 86 degrees north and 80 degrees south. The degree of indection, of course, vance widely, some idea of its severity may be gathered from the figures in a number of infected regions. In one distance of the Cabe Subsequent of the Subseq factor among the inhabitant showed only one or two who were free—an infection of tion among the rural popula-tion of the plains of India averages 80 per cent In the language Valley of China is is conservatively estimated that 90 per cent of the farmers that 90 per cont of the farmers suffered for those areas of Ceylon, Fur, Seychelies and Sam in which the International Health Board has carried on operations the average infection is 951 and after treatment per cent. For Ceylon alone properties that the carried of the period of the control of the farmers of the farmers of the farmers of the control of the farmers 
per cent

From what has been said as to the manner of com munication, it will be realised that prevalence of th

disease is due entirely to lack of proper disposal of human excrets. If these are so handled that their content cannot reach the soil to pollute it, the problem is solved. The campaign solved The campaign against the hockworm there-fore takes two directions-the spread of infection is to be checked by adequate to be cheesed by accounted as anitary installations, and the members of the community who are infected age to be cured if this be possible. What the first item means

is difficult to realize on the part of the average cavillated community, where sanitary arrangements that are at least decent in their ex-ternals have come to be the accepted thing. The condi-tions under which what the (Continued on page \$55)

# Hunting Submarines with a Sound Detector

# American Invention That Played an Important Rôle in the War Against the U-Boat

By Brewster S. Beach

A FIRE meaty two years of the closest censorship, the Justice Sistem Navy Department has given approval ment in the United State of Law Department and the special means in the United States during the way, of submarine driecting devices, which were used to agnal advantage by these country and the Allies in prosecuting and beinging to a successful conclusion the campaign against the German U-box.

German U-boat
The apparatus may be termed the composite work of
the General Electric Company, Submarine Signal Com-

cable to the operator who was located in the ship s hold A third adaptation of the intening principle was an instrument which protruded through the hull and was a stationary part of the vessels equipment. A somewhat similar device was constructed for use on submarines but aminar across was constructed to use on summarines out all of them were used to advantage. Phonograph records of various sounds heart as early to record of the accomplishment of the decetor. These records were used in training attudents to distinguish between submarine training attudents to distinguish between submarine and surface craft

versally adopted by all the Allied navies

It was found to be much superior in many ways to

any of previous development and come to be considered one of the most effective offensive weapons ever used against the submarine It is only necessary to recount a few pertinent points to illustrate the practicability of

Under ideal conditions with extraneous noises reduced to a manmum or entirely eliminated effective at a range of from 15 to 25 miles average elroumstances, the device was good for a range of between 3 and 8 miles Trained operators could clearly and invariably distinguish between the sounds made by approaching surface traft and underwater vessels (submarines) Within five miles the engine characteristics of different vessels was clearly marked even to the point of identifying by name certain (unseen) vessels after they had been observed previously for more than one time (This test was substantiated by a series of night time experiments at the entrance to Boston harbor in September and October 1917). It was found engines to electrical drive which was necessary every

practical to tell when a submarine changed from her oil time the vessel submerged



While demonstrating the device to the British Admiralty our American engine were asked to study the questi ni of fitting submarine detection units to airplanes, balloons and dirigibles

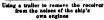
After some experimenta-tion followed by more prac-tical tests and conferences with the Lancashire Group

912 226 Attach by Unit 6 started 10% Attack by SC41

Start-9

the direction of sound could usu ally be computed within a very few degrees of its actual location and a good judgment of the distance could generally be made This was proved to the satisfaction of all concerne l following a number of practical tests off Cape Cod Mass in the late ston and m Long Island & While in fairness to all of the sound

detecting devices developed during the war period it must be said that the American device was inferior in certain respects when it came to the application of these devices under tual battle conditions but in heavy sea and weather they stood up re-



pany, Western Electric Company, the National Research Council, assisted and National Research Council, assisted and advised by many eminent scientists engineers and research men, chief among whom were Dri W R Whitney, Irving Langmur and W D Coolidge, Prof R A Militan, Prof Max Mason etc Realising that the prompt solution of the submarine problem was the key to a successful termination of hostilities.

Secretary Daniels, immediately upon our entrance into the conflict appointed a special board to devise ways and

as special boards to development approached a special boards to development of the suggestion of Dr. Whitney a group of seminists was formed at Nahant, Mass, under Dr. Irving Languir, where the results of extensive research activity were put to practical tests under actual conditions as nearly as possible approaching those in European waters as possible approaching those in European waters as possible approaching those in European waters are possible approaching these in European waters are possible approaching the continuous control of the efforts of these two groups and the work of Out of the efforts of these two groups and the work of Out of the efforts of these two groups and the work of Out of the efforts of these two groups and the work of Out of the efforts of these two groups and the work of Out of the efforts of these two groups and the work of Out of the efforts of these two groups and the work of Out of the efforts of these two groups and the work of Out of the efforts of these two groups and the work of Out of the efforts of these two groups and the work of Out of the efforts of these two groups and the work of the output of the efforts 
The apparatus, finally perfected and put to immediate use, was first designed to hang overboard from naval orait amidship below the water line and it depended for new name and the state time and it depended for its direction getting qualities on the peculiar and services little understood faculty of the human car to detect the direction of sound by the shifting of that sound from one car to the other.

Owing to the interference of sounds made by the listening ship's own motors, it was found more practical

to stop the engines when about to take observations and this added greatly to the effective range of the instrument. To overcome this obstacle, another device was developed which could be strilled off the stern a hundred or so feet away where the engine noises of the ship were out of range and the sound was then brought in by electron.

Attack Unit 10 -Index -· Listening · · Depth Charge -- Base Path of Chasers -- Course of Submorine Chart of an actual pursuit of a U-boat which ended in the destruction of the submarine

of scientists at Harwich, apparatus was developed which met these needs and many aircraft were equipped with sound detectors which rendered it possible for them to follow the course of the enemy after they had seen her submerge a valuable fa ulty which such craft did not possess until the introduction of the American

Permission has not yet been tained to enter into a detailed de scription of the devices invented during this period. The Govern during this period. The Govern using the having spent large sums of money on the apparatus, desires the intricacies of its

manufacture still kept secret, while other matters involv-ing several American concerns makes discretion the better part of valor in attempting to tell the inner secrets of its development

However, when the devices had proved themselves eminently satisfactory after exhaustive experimentation eminency saturations after examinative experimentation here, the Navy Department organized a special Service Party under Capt. R. H. Leigh of the Bureau of Steam Empineering to demonstrate the directors to the British Admiralty Shortly after the arrival of this party



Using the listening device in an American submarine

markably well. This factor was if especial value during operations in the Lightle Channel and the North S which has been termed the roughest body of water for its size in the world

The addition of these listening devices to submarines the addition of these insteams deverse to submarines added the heretofore lacking sense of hearing to all the underwater craft and made them at once a much more effective weapon of offens. An Allied submarine on one occasion chased a German U boat for four hours, while both craft were submerged, without once losing (Continued on page 555)

# Reconstruction in Europe—VI

The Status of the British Railways

By C H Claudy, Foreign Correspondent of the Scientific American in London

MANA Americans who have followed the British MAN Amorieans who have tollowed in british for reconstruction problem closely and who have looked with approving and even cavious eyes on the splendid preparedness for peace which Groat Britain has displayed have been tempted to wonder about the English railroad and its share in the reconstruction

The average American traveling in Ingland has nothing but fun to poke at the linglish railroad. Its engines are little try engines. Its fright cars are coverable with a pocket bandler had an it its passenger cars are little my c than girth I stage coaches. Its cars are little more than girth I stage coacars are little in it. I tail if vinit is take consules to taket system is. I haugh and its baggace system is a crime its stations are in thing like as commodious or as beautiful as the it. I builted Rates and so on from anokostack t. c. il. spike. And now that I ragland is getting rea.] to reconstruct her exconome and her in dustrial system many Americans wonder why she is not also going to make a close sweep in railroads and give the little island a brand new and of course an American

Before going into the subject of the standardisation of British railway equipment as olaborated by the Ministry of Reconstruction it may be well just to glance at one or two things about this toy railroad system that will lesson the intolerant criticism so often levied by the American traveler and make him realize looking back on our infroad muddle as it was in the winter of 1917 18, that the new country may learn something from the old even in railroads

Less than 24 hours after war was declared between Great Britain and Cermany practically the whole rail road system of England Scotland and Wales was operating as a single road controlled by a central rail way executive committee which has the very broadest powers from the government. Not a bad instance of the value of real preparedness—the needful legislation had all been passed years before and had lain quiet dormant

awating the national cinergency
And this is the way it worked Within 10 days the first British army 120 000 inch with complete equip-ment was in France and was well supplied with all it meant was in Franciscus was west experience with an inceded of food and guns and instruit generally. Many years before the war mobilisation procedure had been prepared and as a result of fixed schedules well planned long in advance trains rolled into Southampton every 12 minutes for 16 hours of the day. Any train over twelve minutes late lost its place and would be side-tracked until the whole movement was completed inasmuch as the first movement called for upwards of 1,500 trains it is perhaps not a bad achievement for a 'toy' railroad system to find that not a single one was late and none lost its place in the schedule! One wonders if there is any American railroad which could duplicate that feat from existing plans?

This is not the place to try to tell what the English railways did in the war bow their men volunteered until the government had to put a stop to it how they tore up track to ship to France how they robbed their shops of men to send to dockyards and naval works how they supplied telephones and power, how they took over gaval repair shops and ran them how they kept the artering of ladystrial travel moving even while they rushed goods abroad how they moved troops and served the central military asthority in a thousand ways Effort is made here merely to emphasize the point that regardless of how inefficient and toy like the Inglish railroad appears in American eyes when it came to the point it functioned and functioned will and still does function sixte of the fact that there has been little upkeep and only necessary repair and practically no new ment for four long years

A word as to the why of the little car the small rigine the compartment coach. Figland is a thickly ngine the compartment coach rightness is a thickly populated land. Her villages and tiwns are closed together She can load a string of little goods vans at London and drop them off one by one oach loaded with the freight for some particular town in half the time in which the same task could be accomplished with our huge freight cars which might have to be unloaded at each station keeps g the train waiting. Her traffic at each statuor except clue train waiting ther trains very draws and her trains very numbrous Small savings of time are necessary everywhere. There is no question that a series of compartment coaches can be emptised and filled again a good deal faster than can American conches with doors only at each end. Again the clearance on English railways is less than ours. That means we can have boilers and grates of far larger capacity than can the English engines

England is very nearly a hushed country as far track is concerned She has hardly any grade osungs. To undertake to raise every top crossing of as track is concerned as track is concerned one mis narmy any grown crossings. To undertake to raise every top crossing of every road in England in order to make possible bigger engues to haul bigger cars would be a financial burden which the roads (some 20.000 miles of first class railroads) alone could not stand Even with great government assistance it would mean a staggering burden of taxation upon a people already taxed for war about as much as 14

humanly possible

With these things in mind it should not be difficult to see why the reconstruction programmin regard to railways does not recommend a complete change from existing standards to those found good in America The Finglish roads are not inefficient and they could not stand the cost of a complete change-over even to gain those things in which the American system would be good in Figlish

There is one thing in Ameri an practice which the English railway knows little about and which the English overnment in its Ministry of Reconstruction thinks it hould know a lot about an I that is standardisation About the only thing which is stan lard in Luglish rail ways is gage which is the sum as the American ways is gage winon in the sum as the American Dut noarly everything else is in livelinal Almost all the locomotives built in England for use on English railroads are built by the railroads who homend to use them Therefore each road dougns its own engine and has its own eystem of jigs and templates its own ideas as to of everything, from a coupling pin to a drawbar as result hundreds of repair plants carry thousands suses of everythi of different kinds of parts in st x k and the engine from one road cannot be helped much in the shop of another As the government has found while running all the roads as one this is a matter of vex strous delay and high cost There are on British railways over 200 types of axle boxes over 40 variations in handbrakes and at least two different systems of continuous brakes making it necessary for vaus and wag uns to have two distinct brake systems if they are to run over two different roads!

Again the locomotives thems lyes are of an infinite varioty not of types but of kin is within the types company has had 33 different types of engines and has now standardized on three. Why didn't it do it years ago? But this is a story on the reconstruction to come not on what might have come and didn't

The war has taught both givernment and railroad company that individualiem run riot in a vain effort to up competition and get shead of the rival road, is not a paying policy Individualism in manufacturing has been the cause of Englands I sing many a foreign market on manufactured govis lack of standardised hop practice and parts are what has made it imp for England to have a universal cheap automobile a dollar watch, an efficient typewriter manufactured at

Railroads and government are now at one in the idea that standardisation must be effected on English rail that scandards and in must be elected on English rail roads. The roads want to go slowly because of the lack of material which the war has made difficult to get but they are willing to move. Hence it is that the govern ment in its recommendations seems destined to get some very real and practical results

some very real and practical results

'ummarized these reconstruction recommendations
stand first for the standar lization of wheels acides
whool content, stres running K ar draw g ar buffing
goar bogies brakes and ut it frames under such restrictions as will make it possible for all roads to adopt

strictions as will make it possible for all roads to adopt these standards with as little hardship as possible. British railroads earry too much deadweight. On an eight-ton wagon the tare: 70 per cent of the load as against 40 per cent in other countries. This is ob-viously too much and a fit ground for reconstruction. Hence the Ministry's committee recommends an immediate investigation into gages and clearances into this excessive tare may be reduced by a greater uni

formity in rolling stock

It is proposed to ascertain by independent government accounts what the costs of locomotive construction and rolling stock construction may be as contrasted between private firms and rulway workshops with a view to seeing if some reforms cannot be made in the almost universal practice of letting every road be its own

It is also proposed to bring together for consultation representatives of railroads financed by British capital in foreign lands and the various dominions railroads, and see what they, with the railway experts of Great Britain,

can work out in the way of international standardisation

Finally a definite policy of locomotive standardiza-tion has already been determined upon by the Association of Railway Locomotive Engineers, which has recomof Railway Locomotive Engineers, which has recom-mended two standard types of engines, two kinds, a heavy and a light for each type, to replace the present multiplicity of kinds and types which make the English locomotive so troublesome when it comes to repairs

Nothing very drastic from the American standpoint, and certainly nobling to change much the outward seeming of the toy roads But the little engines and cars have demonstrated that they can "deliver the goods and the English railway organisations have shown as ours in America certainly did not show until some time after the war was well started that national emergency they were distinctly ready. All of which is respectfully submitted for the consideration of those critics over here who are perhaps, a little too or those critics over here who are perhaps, a little too ready to think that a thing which is good in the United States must be good for England It is submitted in defence of the mildest of reconstruction programs—a program which, when the facts are understood, really

## Developments in Making Acid-Resisting Iron

DEVELOPMENTS in the manufacture of acid-reasting iron particularly for chemical plant purposes were discussed before a British Chemical Sognity recently

It had long since been proved in the laboratory the speaker that a pure form of iron could be rendremetant to either sulfuric or nitric acid by the addition of a suitable proportion of silicon, chromium or other elements but the development of such metals upon as industrial and commercial basis was not approached until some twenty years ago. In more recent years the electric furnace had proved a valuable aid in the satis-factory commercial production of such alloys as ferrosilicon and ferroshromium lests made by Kowaike in America had shown that silicon present in a lesser quantity than 12 per cent did not promote satisfactory resistance to corrosion while when it reached 19 per cent or more the acid-resisting quality of the alloy again fell In addition to the difficulties presented by the serious shrinkage of non-corrosive iron castings during cooling, shrinkage of non-correnve iron castings during cooling, which amounted to slightly over M-inch per foot, in each direction as compared with a shrinkage of about 33 22 inches per foot in the case of ordinary cast iron, the presence of graphite in any considerable quantity the presence of graphite in any considerable quantity caused disaster. The iron must also be low in carbon and oppositions otherwise during the process of cooling these compounds tended to esparate out and form these compounds tended to esparate out and form

The following were the physical constants of acid-

| remaining from as compared with eas | t iron           |                               |
|-------------------------------------|------------------|-------------------------------|
| Density                             | Cast-Iron<br>7 3 | Acid-reciation<br>iron<br>6 8 |
| Tensile etrength (tons per sq in )  | 9 to 10          | 6 to 7                        |
| Melting point (deg C)               | 1,150            | 1 200                         |
| Hardness                            | 24               | 35                            |
| Heat conductivity                   | 10               | 8                             |
| Electrical resistance.              | 8                | 10                            |
| Contraction per ft in casting (in ) | 3-32             | 9-32                          |
| Crushing (1-in cubes) (tons)        | 40               | 84                            |

The heat transmitting power of acid-resisting iron had been calculated at 10 times that of stoneware or quarts, and thus the parts could be made much smaller A condenser built of acid-reasting iron condensed a charge of nitric acid in 16 hours as against 39 hours with a similar condenser built of pottery With all this success there were etill difficulties to be overcome All alloys there were ctill dimentities to be overcome. All alloys of low-silicon content, say 10 per cent, were attacked very readily by certain acids, and while acid-resisting iron which contained from 16 to 18 per cent, was satisfactory from the viewpoint of resistance to said, it was very hard that it was impossible to machine it in any

other way than by grinding with high-speed abrances.

Apart from chemical apparatus this iron has a wide application for anodes in connection with electrometal-lurgical processes. On the outbrask of the war it was impossible to obtain magnetite anodes, since these were chiefly made in Germany, and a substitute was found in and-resisting iron While the material was not absolutely unacted upon when used for this purpose in copp sulfate solution, many times its original weight of copp could be deposited before the anode showed any serio

# Exploring by Airplane

# Some Opinions on the Possibilities of Winged Exploration Parties of the Near Future

By Eric A. Dime

0 6 1919

CINOE the great world war came to an end, there has beef some speculation as to the new field in which the flying machine may play an important part. The constitution of the control of the properties of the flow of the control of the present of the National Control of the control of the present of the National Control of the control of the present of the National Control of the 
the bringing of man into those unknown region work—the bringing of man into those unknown region of the earth for the study of nature and anumal life. The long range of sustained flight and high attitude, of which our arplanes are capable, should nake these machines extremely valuable to the explorer, the naturalist, and the huster who wander into the wilderness in quest of something that would benufit science and the human

That some of these men are senously consu airplane in exploration work may be known from the fact that Capt Robert A Bartlett, who accompanied Rear-Admiral Peary on his trip to the Pole, has decided scen-admiral reary on his trip to the role, has decided to employ the figure machine on his proposed Roosevelt Memorial Expedition, which he will lead next June to make an aemal survey of the North Pole

Turning our attention to Africa South America and

other countries with unexplored territory, I believe the time is near at hand when expeditions equipped with flying craft will venture into rigious which so far have paret been seen by civilized inan. From interviews I never been seen by civilized man. From intercuess I, shave had recently with man who are familiar with exploration work, I have gained sufficient information to beliave in the practicability of the airplace in this field Of course, there may be aim drawbacks to such a working, the country to be capitally pixed would determine the success of the undertaking. I unthermore, a machinised for the work would necessarily have to be of a design different from the initiary type or the interest used for passenger and commercial purposes. This would be the case in exploring, jumples or deep forests broken by high mountains for which Africa and South America are known.

Carl F Aksley, known as our of the most famous.

America are known
Carl F Akeley, known as one of the most famous
taxidermists and soulptors in the United States, who has
charge of the African Hall in the Museum of Natural
History, Now York, is playing great faith in the airplane for exploration work. Mr Akeley is the inventor of the Akeley Camera, which has been used with excellent results by American photographers near the front line trenches during the war. He is also an explorer and he plans a trip at the end of this ye is to Africa in the interest of science. During a discussion I recently had with Mr Akeley he said that there are still great fields open for exploration, especially in South America, Africa, Madagascar, Asia, New Zealand and islands in the Pacific Ocean The reason why splittle is known about those regions is greatly due to the difficulty of getting into the interior with the ordinary means of travel

Mr Akeley believes that it would be possible to fly Mr Akeiey believes that it would be possible to fly into the country to be explored and locate a suitable landing place. Then it would be a matter of study-ing the country, its natives and animal life in the immediate neighborhood. It would no doubt be better if a group or squadron of planes could make the trip as It might prove too risky for a single machine to set out into the unknown. The explorer-aviator might find it difficult to locate a suitable landing due to der forests but I understand that in some regions like Central Africa there are wid open spaces with short grass that should prove a lead as an amplane's landing starting point

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During a lecture recently delivered before members of During a lecture recently delivered before members of the Aeronautical Society Mr William Belle of the New York Zoological Society spake on South America and the Airplane He illustrated his speech with lantern slides showing photos of forests taken from airplanes. The pictures were from the battlefields of France but Mr Boebe used them incredy to describe what might be done or South America with an mrcraft camera done in South America with an interest camera. In his leature its add among other things that some interesting sights could be seen by flying over the vast forests of South Amiria. The man who travels out the ground said the lecturer which the crowns of trees in the dones forcests present which the crowns of trees in the dones forcests present such a study of a forest with its bird to the aviator life ought to tempt many an aviator to take a trip that would prove fascinating while at the same time a little risky and dangerous

The arplane should prove a valuable factor in the mapping of a country and this could be done with a mapping camera. The photographer could soar over the gigantic forests and rivers of which we today know little or nothing Every large river and its tributaries in South America could thus be recorded for our geographical records

It might be stated in this connection that a mapping It might be stated in time commention that a suspense caurea designed for arriphants has been invented. It is called the Brock Antomatic (americand is suspended from the fuselage of the machine. It is so pivoted that (Continued in page 186).

# Correspondence

The editors are not responsible for statements made in the correspondence column Anonymous commumentions cannot be considered, but the names of cor respondents will be withheld when so desired

## The Canal Street Hudson River Tunnel

To the Editor of the SCIENTIFIC AMERICAN The meeting of the American Society of Civil Engineers held on the evening of the 19th of March, was geneen held on the evening of the 19th of March, was one of the most interesting that the writer has ever attended. The paper presented was by Mr. Austin T. Byrne on the proposed traffic tunnel under the Hudson Biver at Canal Street from Manhattan to Jersey, with coppeal reference to the plan approved by Cen. Go. W. Goethals and on the plan of assertions as proposed by Jone F. O Rouths: the noted foundation expert and

Jno F O Rousk: the noted foundation expert and tunnel builder.

The need of such a tunnel or an equivalent method of carrying the highway traffic from Manhattan across the Hudson, is conceded by all persons and by all engineers that have studied the problem, and I am sure after listening to the discussion of the paper, that all of therepresent at the meeting were not opposed to the building of a tunnel, but as Mr Forgre expressed it, they have their doots about the methods proposed, and, to som extent, about the ventilation of such a bore to carry automobils triffic after it is fuult. There can be no doubt, after the mesterly analysis made by Mr. Byrne have available to carry upon its completion, as to the need for haste in doing something to relieve the traffic barrier than now waits. barrier that now exists

The discussions by Mr Jno V Davies and by Mr se Forgie, the noted tunnel expert, made it very James Forgia, the noted tunnel supert, made at very easer to those that there were many grave problems to be solved, before a tunnel of the magnitude of 48 feet that has been groupsed could be constructed, such as the design of the shield and of the lining. There us no manner of doubt in the wrater's mind but that the shield as proposed by Mr. O'Rourke has many good points, and it would sleam, it a careful sately off it were track to the light of the experience that was gained in the construction of the present Esistica. River and the Thanne Expert tunnels at Lowdon, that a modification of it might preve successful. This can only be determined by a most careful analysis by expert engineers and then by the expenditure of a comparatively large amount of momy in its con-

There was a manufest dismelination on the part of the engineers present to give any red consulting engineering free, and this is manifestly priper is the states can well affort to pay for the most car full missingston of all the points involved and the expenditure of \$100,000 or more for such engineering work will extrainly result in the saving of millions of dollars in usekes expenditure and in some great engineering i put itims that otherwise may go on the rocks

The remarks of Mr Walter ( Parmles who has had large experience in the use of con rate blocks in a smaller but similar tunnel 15,000 feet long it Cleveland under Lake bru makes it apparent it I not all of the trouble has been anticipated in the lesign of the shell of the proposed Hidson River traffer luming and that if the ngn is persisted in trouble will result not only from packing stresses in the conjet in shoving the shield shead but that there is very serious doubt as to the stability of the shell. This confirms the belief of other requirers of experience that I stage will most surely result if the structure is finally I still I have objections again are not beyond the reach of executi study and

analysis. The construction of the present tunnels under the Rudson and of those un't in Inhams showed on-cleared with the varable present of compressed any required at the bottom of the shill define the square and the special state of the state of the special state of the state of the special state of the state of the standard special special standard special spec The construction of the present tunnels under the

until it became certain that electric traction could i

necessfully used. The Mersey and Severa tunnels in Ingland were built for steam traff c but it did not re quire long for them to be changed to electric operation as soon as it was assured of success The Severn tunue it is true was practically 23 000 feet in length and had fans to feet in diameter and 12 feet wide. The Morsey turnel was 8 100 feet long and had a separate turnel drivin alongside of 8 ven feet dismeter for ventilation the fans being 40 by 12 feet and 30 by 10 feet in size This will bring forcibly to the Liv mind the difficulty of ventilating funncls and many other examples might be cited to make more forcible the gravity of this problem in tunnel operation. The recent change of the (ascade tunnel on the (rest Northern Railroad in the (ascade mountains from steam operation to chetric is well

When the question was asked Mr Byrne as mount of automobile traffic in the Blackwall and Rother buthe tunnels under the Thames at London the hist named being 1 465 feet long for the enclosed portion and the latter being only about as short as this his ripls was about 40 per cont. The figures given as probable for the Hudson as derived from the I set River bridge traffic was about 80 percent of the traff cassanto cars or trucks, which is double the figure for the London tubes. You which is conjucture injure for the common turns for its squite sure that the assertions of conjuctures who have carefully made personal investigations of true that it is necessary to shat down the traffic in the I ondon tubes at frequent intervals to all we them to clear of implement and dangerous fumes.

The gas to be dealt with is the deally carbon monorade, which in any considerable amount is titul, and in any amount greater than one part in 2 000 will in time cause those that are brought into constant contact with it to those that are prought into coust in contact with it to contract decasts of the circulatory system such as pneumonia paralysis and interpreteress. This was all pointed out in the Vignet 4th 1917 issue of the SCIENTIFIC AMERICAN in a letter signed. Yow Yorker who, as the writer happens to know his made the most extensive nevestigations into the subject that has been undertaken This study was made for a similar project contemplated by another city. The Scientific Ameri-This study was made for a similar project can at that time commented on this editorially and complianced the need for caution in going aboad with any traffic tunnel such as was contemplated for the Hudson River This was mentioned in the discussion at the meeting of the American Society of Civil Engineers, and attention called to a more recent article in your (Continued in page 458)

# America's Great Effort in Ordnance-I

Supplying Our Two Million Men in France with Artillery, Machine Guns and Rifles



A train of 7-inch naval guns and 12-inch army morters on railway mounts

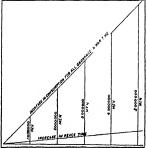
We doubt of many Americans outside the War Department have my conception of the continuous scale upon which our production of ordinance was conceived and carried out in the late war. Indeed, of a twill come with a shock of suppress to the average either to learn how large a proportion of the cost of a war is due to the production of artillery. When the was crossed on November 11th it in he is the hardest National production of the cost of the war is due to the production of artillery. When the was crossed on November 11th it in he is the hardest National production of the control of the control of the control of the control of the cost of the control of the cost of the

The work expenditure recyding of the neutron straight and many in the first in the int of in recyclor ill or finance in poor and in war time where it is fully 1000 per cent figures. It was and trace you must be amount of minimum to recycled in peace time are very motivate the animum to being that dex it it target practice and the minifer of rounds fired every motivate the animum to be per base little crossing its animal being a finish to be per base little crossing in the many in the contraction of the

### It Is Ordnance That Makes War Costly

Furthermore, it is generally not understood that ordinate melluling rifes, meshing can fit fail daid heavy guns produce and explosives is in itself exceedingly cutty material. A driver vision size in itself exceedingly mately estimate the cost of heavy artiflery on a basis of \$1000 per foun set that of 2 mells "before gun would cost \$70 000 Individe cost \$1000 per foun all may approximate \$3.000 to India must be

added the cost of the gan mount. Moreover, in the whole beld of michanical again, or gitter are few if any constructions which call for wales dutely high grade in all its various branches. Before, a point of material can be fabricated and finished in a country like oursthat is totally imper part of for the waining of war of



Rapid increase in demand for ordnance in wartime

the first magnitude, it is necessary to begin and build everything from the ground up, and the various plants must be of first-class construction and they must be filled with machinery of the saw high quality active gues which they are built to mainful ture. Add to this that material and labor costs we very high when we cortered the war and that they i minuted to rise at an ever thereasing rate, and keep in mind that the propetitis size of our sumy had meen to 5,000,000 men and weval million more than that if it should prove to be necessary and it will be understood why, by November 11th the total amount spent for ordnance was \$5,50,-111,438 is and the total amount appropriated was \$7.75.204.57.1

### Why France and Great Britain Supplied Our Artillers

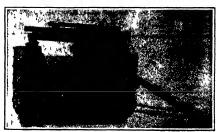
lumediately after our declaration of war, an American immession went to I urope to reducid with our Allies and determine upon a bioach plan of cooperation and asthe result of that conference the following situation developed

Both the British and the I reach had developed their redman e plants to such an extent that they had completely equipped their soveral arms with all the ordinance they could use—that is to say, the supply had overtaken and exceeded the demand. Great British mideed was in the two of hemanding a lorang part of her mustion is latered to the same properties. The same properties the transfer of the same properties to the same and the same properties of the same properties. The same properties the same properties to the point at which they would be sufficient to take care, of replacements I aperionet had demonstrated that when once an army is equipped, the annual explacement of worm and destroyed and captured guias amounts to about 16 per cent of the total equipment, as any, three will be an equivalent addition of 16 per cent for total replacements, as is shown in the accompanying diagram.

diagram in the reports tabled to Washington from brancs by Central Forshing and teneral Blue, they stated that the French and the British, by maintaining their great ordinance factories, would be in a position to equip as Ann rench Aray of a million man with artilley in sax months time. The French offseed to provide us with all the grant we should need 0.75 mm and 105 mm cabler, and the British offseed to supply us with all the heavy calibres Sanch, 9.2-mb, 10-mb, 10-mb, and 12-mb, heavy calibres Sanch, 9.2-mb, 10-mb, and 12-mb, heavy calibres Sanch, 9.2-mb, 10-mb, and 12-mb,



Eight-inch howitzer on caterpiliar mount



A 75 mm. gun mounted on a tractor

both howitzers and guas. They asked us to concentrate on propellants (powder) and high explosives

A great deal of unjust criterian has been directed eigenst the Army Ordnance Department, hased upon the mustaken impression that in ascepting these Fronch and British guns, we were taking material which our Allies needed for themselves. As a matter of fact, we accepted these guns on the armeter representations of our Allies and sile—and the armeter important point—because our using French and British guns yould greatly relave the silepping situation by the contract of the silepping situation in the contraction of the silepping situation in the contraction of the silepping situation is the contraction of the silepping situation in the contraction of the silepping situation of the contraction of the silepping situation of the contraction of contraction of ordnance o

## We Build Heavy Come

In addition to requesting us to concentrate on powder and high explosives, they asked that we should use our

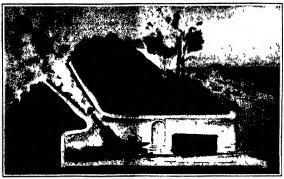
great manufacturing espacity in providing high-velocity long-range guise of large caliber—12 inch, 14 inch and lof-inch, for the bombardment of the back areas of the enemy. To this end we made use of large numbers of our heavy coast defense guisa and of certain very powerful pieces which were on hand in the Navy Department we had a large amount of the artificry built or coming along rangify in production when the war raine to quiete the superior of the production when the superior to the production when the war raine to quiete the superior of the production when the war raine to quiete the superior of the production when the war raine to quiete the superior of the production when the war raine to quiete the superior of the production when the war raine to quiete the superior of the production when the war raine to quiete the superior of the production when the war raine to quiete the production when the productio

# Our Output in New Field Artiflery

During 1917 the enemy still continued to show surprising endurance and striking power and it became increasingly evident that the collapse of Russia was going to release a large number of divisions from the eastern front which would be available as a Catuma reserve for future operations. Consequently and very wisely our Army Ordnanes Department laid down a construction program based upon the possibility that there might be tenance ultimately of an army in I rance of four or hye million men. It would not have been was to rely in definitely upon I reach and British gus and shell plants and it was felt that we ought to cover all future ton by bending every effort to produce a maximum output of new artillery of all calibers and this was done. Huge plants, too many for enumeration here, sprang up all over the country, existing industrial plants were changed over for the construction of artillery, and several enormous plants were planned and construction begun upon them. We took up the manufacture of mortars such as 240-mm trench morters, the three-inch, four inch and six-inch Stokes inorters, we purchased and equipped an entirely new proving ground adequate to equipped an entirely new proving ground acquate to the enormous amount of testing and proving work of all kinds which would become increasingly necessary I has plant, which was located at Aberdeen on the Chesapeake, rapidly grew to be the largest institution of tak ind in the word, and at the signing of the armsities it included a staff of over 300 officers with 4,800 enlisted men Additional proving was done at Carney's Point, Sa vannah Scituate and Erie proving grounds. This highly creditable branch of the work will form the subject of the second chapter of the series in which we shall give the detailed statistics of the guns, and howitzers furnished by our Albes and manufactured in our establishments

# Rifles, Machine Guns and

The Department has every reason to be proud of its watume work in the production of rifes, mechine guns and ammunition I he table showing the total production for France, Great Britain and the United Nitates from April 1st, 1917, to November 11th, 1918, proves that, as compared with our Allies, who had a ranning start, we produced nearly as many rifes as the two nations combined, and were coming along fest with machine



Powerful howitzer, empiaced in a kill, which German airmen could not locate

# PRODUCTION OF RIFLES MACHINE GUNS AND AMMUNITION

|                 | Riffe     | Nh i<br>Rill v | Mari<br>Cins | Amnuultion     |
|-----------------|-----------|----------------|--------------|----------------|
| France          | 1 416 080 |                | 4.64         | 20831 7 000    |
| Circul Britain  | 1 971 764 |                | 151 104      | 4 486 127 (00) |
| I nitrel Histor | 8 115 307 | 71 H           | 144 41       | 46 008 100     |

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ORDINANCE

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Shaded areas show 15 per cent increments for



Twelve-inch army gun, on railway mount, range 28 miles

How rapidly our output was mounting will be seen in the table showing the average monthly production for July August and September 1918, when we were turning out nore rifles machine guns, and amount tion than our two allos and nearly as many rachine rifles as the breuch. The British Lewis gun in the natter of weight, comes in law between the Irench Chau hat and our own Browning machine rifles and the heavy water coled Vickers and Browning machino guns I uble in a trunce in the early days of the war was natural but it is now recognized that the delay was due, mainly, to the fact that we decided to use the rimless cartridge, which has undisputed advantages, and that this necessitated making ecrtain modifications developed the Browning no. chine rifle and machine gun, both possessing points admitted superiority

# AVERAGE MONTHLY I ATF OF PRODUCTION

|               | Riffor | Mach<br>Riff # | Mach<br>(uns | Anamuni<br>tion |
|---------------|--------|----------------|--------------|-----------------|
| f) ince       | 40     | 0 644          | 2 4%         | 139 845 000     |
| Great Britain | 11-5-1 |                | 10 17        | -59 769 000     |
| Init d States | 33.562 | 0.403          | 18 067       | _"" R94 O(IO    |

At the opening of the war our force of officers and menwas ride cloudy small (thanks to Congress) for antonor 110 000 000 souls. Not the hast form lable task confronting the Department was to create a force of technically instructed officers and trained men comministrate with the vast expanse on that was to take place in all nosed to haste.

# 1 FIGONNII OL ORDNINCE DELARIMENT

|               | Officers | I nilated Men |
|---------------|----------|---------------|
| 1911          | 84       | 5140          |
| 191           | 83       | 510           |
| 1 +10         | 83       | 590           |
| Virti 101     | 97       | 825           |
| Nevember 1 1  | 1 595    | 3 521         |
| April 1stix   | 4 123    | 22 216        |
| November 1918 | 154      | 6. 017        |

It is hiped that the above outline of our activities in meeting the ordinance emergency will settle forter in the minds of all to whose attention it may come the conviction that our achievement in ordinance was not only the greatest but one of the most mentorious in the whole range of our constructive operations.

(In be continued)

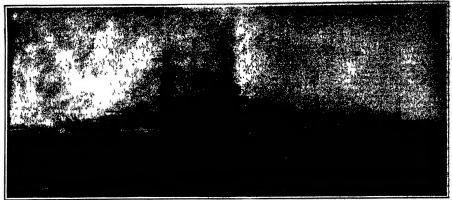
# Construction of Large Motor Vessel in Glasgow

Till British twin series Diesel engined vessel therapp, which has just been built by a Clasgow ship and is according to the local press the largest and most powerful motor vessel in the world. It is of 10 000 tons deadweight, and has two sets of engines constructed by Messrs Harland & Wolff, at their Clasgow works. Hose give a total of 6 000 which figures represent a very marked progress in this tryp of vessel. The engine room auvalances also all deck machinery,

melating the steerin ggear are dictinually diven, the power bring generated by two auxiliary Diesel sets in the eight room A small olfuel loider supplies steam for leating and coding systems and for irre-extinguishing purposss. The oil fuel is carried in double bottoms.

The vessel is designed with four masts three of which act as derrick posts, and the accommodation for officers and crew is on the most up-todate lines, separate messrooms being supplied for science and motormen and separate living rooms for the crew





The "New Mexico" making 21 knots

### U. S. S. "New Mexico"

### A Description of the World's First Electrically Propelled Battleship

### By Henderson B Gregory

PROBABLY no battleship excepting H M S Dreadmought the piones of all big-gain batters and turbine drive has ever exceted more widespread interest and comment than the I S S New Mixio. the first battleship affect to be equipped with electric

Flectrical promision for vessels is not strictly spealing a new idea It has been agitated for some years past both thus country and abroud but it is only quite recently that it has become an accomplished fact L. R. Emmet belongs the credit on this side of the Atlantic while in Europe the Sycuska Turbinfabriks Aktiebolaget Ljungstrom of Swiden has been the prime

After much writing and discussion on the subject of electric propulsion success was achieved in 1911, when the Navy Department awarded a contract to the General Electric Co. in June of that year for electric propelling machiners for the U.S. Collier, dupiter according to designs prepared 18 Mr. Immed. The unqualited success of this installation resulted in the Navy I epart. ment's decision to usuall decrete propulsion in the New Mexico and after further study and investigation of the problem this decision has been extended to cover all capital ships

The New Mexic is me of the three battleships and The You Mexic is me of the three mattesmips uni-torised in 1911 for sister ships I cang the Mississippi and Idaho will are equipped with direct-drive Curbia and Parsons turbums a spectively. The Navy Yard at Brooklyn we selected to built the vessel and the contract for the determination reviews was warded at a cost of \$431 000

at a cost of \$9.11.000 in appearance the N w McCur viry losely re-sembles litt initial at preferencessors as so in by the picture of the vissel. There is one large smoke pape between the two age masts four tracts on the center line—two forward and two at inconting twich vidence. guns and the usual five inch torpedo detense batter is also provided. The vossel is of the following principal characteristics

624 007 97' 11 2" 30' 00" Length over all Breadth, extreme on 1 W 1 Praught, mean, to L W I

Fraught, mean, to L. W. I. 30 '00'.

The propelling machinery consists of two alternating current turbo-quarators spiriting for motors one concetted to each line of shafting the re-being four propelliers. The general arrangement of the engine and motor rooms is shown on pag. [41]. The motors, when devoloping about 29,000 is highly will drive the reseal at her designal speed of 21 knots the corresponding revolutions per minute of the propellers being 166.7.

The generators have two poles ach and the motor stator windings have a switch while can be thrown to give thein 24 or 30 poles, thus providing two prime speed reductions 12 or 18 to one Speed variation with either pole connection is effected by shanging the turbuse speed.

pole connection is effected by changing the turbuse speed of speeds up to about 18 kines on generators is used to drive the four motors, each on the Bepale connection from 15 to 17 kinets, one generator is used on the four motors such on the 24-pole connection from 17 kinets of the 18 kinets for full speed two generators are used such driving two motors on the 24-pole connection.

The main turbines are of the 10-stage horizontal furtistype, designed to develop full power with a steam pressure of 250 pounds agen at the steam chest. A section through the turbines is shown in Fig. 2. The casings are cast from split hor intally and bolted to gether. The steam end heads: i valve chests are of cast ate I, and the exhaust camps are cast iron

cast are t, and the exhaust easings or creation. The rotor shafts are forged sit I and carried by a bearing of the self-shiring typ at each end. The bucket wheels are forged atcel and security keved to the shaft the first stage wheel having two rows of



"New Mexico's" control lawers set for full speed shoul

buckets, all other stages having single rows All buckets are of non-corrowve material

are of non-corrowve material. There are 30 nosters for the first stage, arranged in 19 groups of three nosales each. The steam to each group of nozire is supplied by a separate valve, entirolled by the governor. The nosales of the other stages are east in the disphragma the latter securely held in the turbuse casings and fitted with packing rings at the shaft bureaut steam leskage between stages. A thrust block is provided at the front end of such turbus pust forward of the main bearing. It is of the single collect yet and arranged for ready adjustment, and the stage of 
Lean turnine and generator is connected togetar by a fexible coupling, to insure proper distribution of the load on the four bearings of the set and to take case of any variation in alinement of tubine and generator Naam for each turbine passes through a strainer integral with the throttle valve, throne enters the steam cheek and from the cheat, as determined by load requirements of the cheat, as determined by load requirements.

ments, through one or more of the 10 controlling valves, to the first stage nozzles. The speed control of each unit is by means of a cantrifugal governor mounted vertically on the front end of the turbuse and driven at

vertically on the front end of the turbuse and driven at reduced speed by worm general from the rotor shaft. The main generators are bi-polar, each of 11,460 ke, expectly at 4,240 or 3,000 vide. They are of standard construction with east iron stator frame and core built up of entmelled steel punchings securely fastened by dovetal connections to the stator frame.

dovetad connectors to the stater frame. The greatestor retors are forged steel having radial siots machined in them to receive the rotor windings, which consist of costs of heavy steap respect connected in series, specially insulated for this service with particular regard to protection against dampines. The rotor undrings are secured against sentificing stresses by matsi wedges provided in he siots of the rotor cope ventilating fains are fastened to she end of each rotor for coring are through the generators. The rotors are carried in self-alming bearings.

Two 800-killwatt, shree-wire, direct currents immediately

carried in self-siming bearings. Two 300-kilowate, historium, site of current, ignared turbo-quaerating sets are installed for excisedant of the main units and for driving empire recon suntilares. The turbines for these sets are non-condensing, the exhapst steam from saints being used in the fifth or eighth stages of the main turbines according to the load on the pink units. In addition to the 300-kilowatt excite gets, there are two motor generator boosters through which its vottage delivered to the hand generator held on he yeared to efficiency and tight loads, and date to (similar the temperature). The same constitution accountry when everating. The use of the boosters renders such field warried to self-the without disturbing the vottage delivers of the house of the same of the same of the house of the boosters renders such field warried to the neglow which drive similaries. The state belowed to the neglow which drive similaries.



the property of the control of the c

or dip of rotor decreases and the motor speed approaches that corresponding to the of low resistance, carries more and more of the vireulating current, a small por-tion only being carried by troe only being carried by the outer or high resistance har when up to full speed By means of this construction, using the high resentwinding on starting with special provision to care for expansion, the use of external resostate and col lector range on the motors to provide suitable torque con dinens becomes unne

discons becomes unnecessary.
The weight of the rotor is carried by two self-chining bearings supplied with oil from the mean lubricating system. Ventilating fans are fitted at each end

The alternating current switching arrangement com prises in general two eight-pole double throw generator descended and voltage charging switches four eightpuls magie throw motor dispois spage throw motor dis-connecting swith hes all hand operated at place, one bus tie switch, operated from within the switchboard cag: within the switchboard cage two three-pole double throw reversing oil switches and two six-pole double throw pole changing oil switches perated from working platform by the four large levers shown on the opposite page and the field switches, controlled from working platform hy two small outside locome tive lates levers as shown

Under normal conditions the switchboard is operated

tive lasks levera a ontown to metaboard in operated as this organizate location, such side of the skip being in dependently controlled on the skip being in dependently controlled on the skip being in dependently controlled on the skip being operation of the skip of the

of the fact that the light them be opened before

making any change in the switching it is extremely necessary that the field switch be runged and absolutely necessary that the field switch be runged and absolutely switch from jarrang satt and opening the field circumstrict from jarrang satt and opening the first from the switch from paperstus located on the main switchboard in front of the operating temperature of machine wouldings at all lumbs. Neam and vacuum gages revolution counterly, side are also mounted on the board in front of the operation opera

oil at a maximum pressure of 300 pounds per square-inch to the burners which are of the mechanical atomiza-tion, type, seven per boiler

| TRIAL DATA                                       | 4 Hour<br>Power 7 | Full |
|--------------------------------------------------|-------------------|------|
| Stoam at boilers lbs gage                        | 278               | 6    |
| Steam at turbines lie gage                       | 272               | ï    |
| Steam at turbines lat stage lim yage             | 139               | -    |
| Vanuum inches                                    | 29                |      |
| Berometer inches                                 | 30                |      |
| Fire room air pressure, inch w if water          | 4                 | ,    |
| Feed water temperature F                         | 182               | :    |
|                                                  | 4 257             | •    |
| Mala generatora volts                            |                   |      |
| Main generators superes                          | 1 87 1            |      |
| Main gunerators fid volts                        | 171               |      |
| Main generators fid amports                      | 318               | 35   |
| Main generators r p m                            | 2 042             |      |
| Main motors anspered                             | 994               | ō    |
| Main motors r p m                                | 167               | ON.  |
| Slip of propoliers per cent                      | 16                |      |
| Speed in knote                                   | 21                | OR.  |
| Haft borse-power                                 | 31 197            |      |
| Pounds of wates per hour per s h p (main engines | ex                |      |

Acknowledgement is made of the valuable assistance

rendered by Mr A R ( hey-ney of the Bureau of Steam Engineering Navy Depart-ment in connection with the preparation of certain fea-tures of this article and The General Flactric Co for per-mission to publish illustra-tions of the electrical install ation

### Adulteration of Cotton in China

Al the recent annual meet-ing of the Anti Adultura tion Association of Shanghai was brought out that the Chinese had the habit of adding water to cotton in As regards the figures P during the 12 months under riview the association hed dealt with more cotton than in any similar period of its existence Of the quantity for 1917 1918 64 per cent contained more than 12 per cent of mosture and 7 per cent moisture this being curlously enough the same percentage as for the previous season If we allow the Chtnese up to 12 per cent for the so-called natural monthan 71 per cent that came under the notice of the association contained added water over 12 per cent of mons-The constant aim the association is to combat this cuit and everything is

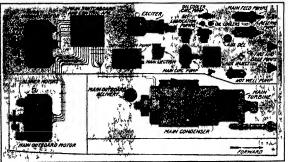
being done to that end Rubber Substitutes for

Cables b rubber is no longer pro-Acurable in Germany for the manufacture of cables and the rubber substitutes obtained in the earlier days of the war are no longer available manufacturers have been forced to make use of bituminous materials or im

lations of the German Institution of Hectival Linguistre have been modified to admit such substitute materials and in the prescribed tests the voltage has been reduced from 2 000 volts to 500 volts after mimerson in water for one hour instead of 24 hours. Accordingly some of the products now on the German market he on the verge of the limit of minimum safety particularly for use in warm damp situations. On the other hand, the M-cables manufactured by one of the German firms with impregnated paper insulation are capable of withstanding the normal peace-time tests.

The article in the Flectrotechnische Zeitschrift continues.

to describe a series of tests made on a number of types of cables including the M-type Most of the samples reached undesirably low insulation values after 15 mmutes immersion in water After 24 hours immersion all of them broke down between 270 and 550 volts except the M-type, that stood up to 800 volts. The effect of bending and heating is also investigated



General arrangement of engines and motor rooms



Cross-sectional view of one of the main turbines

crass-sections gow kyne with tube relied into to take sheets at the inletting of the tubes and stand pe to 1. Steam is generated if the tubes and stand pe to 1. Steam is generated if the lither of the tubes and where the period of the tubes are three separate wateright tompathment. He believe the below a recognition of the period of the popular are designed for a working pressure of 280 pounds are fitted with superfectivity, in a hay a total braiting surface of 8,458 square fort, specifically when an additional total wig 4,470 is pure foot, sufficient for about 400 degrees F, imperiant. Of feel and forced draft are used for the spikers or in notabled, consisting of the spikers of the spi

### Agricultural Labor to Cure Cripples

SCIENTIFIC officiency is poculiarly triumphant when two important objects can be made so to dovotall into each other that a single operation accomplishes the attainment of both a fact realised by our remote an costors when they coined the phrase killing two birds cestors when they coined the phrase guing two birds with one stone. A very striking example of this cornes to hand in a report I ut before the I rench Academy of Scences not long wil as to the remarkable efficacy in restoring wounds I not a suffering from the secondary results of their inpurs to the use of their limbs.

The sequellar as they are termed of serious wounds are various and all mir or less disabling even per manently if special care be not taken to relieve them They include not only the stiffness of the points which is always an attendant of prolonged issue oven where the joint itself remains uninjured but swellings adhesions joint itself remains uniquired but wellings adhenous lank of musuals and nevous per we suffined on me some tissue et al. the he has been to the second tissue et al. the he has been to the second plant of the wound teeff and it would be second plant of the wound teeff and it would be second plant of the world teeff and it would be second to the second tissue that the second tissue that the second tissue that the second tissue the second tissue that the sec to secure the mechanical repetition of the p movements

The applications of water, heat and electricity as curative agents are highly valuable in special cases both as to the local reactions obtained and the stimulus to the eral health house in many instances they are pracsecretary induspensable As far as concerns the medianical exercises however whether as individual gymnastics or as mechanotherapy involving more or less complicated apparatus it has the marked disadvantages of being very expensive of being conducted indoors of being necessaexpensive of one or two hours per day where the number of patients u large and most of all of being so uninterest-ing to the patient as to produce a lessitude and ennu-which are generally unfavorable to the patient s wifare

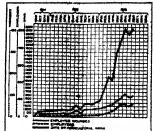
These considerations led the physician who presented the report to substitute agricultural labor as a restora tive treatment for the said sequellas of wounds. The experiment which began in October 1914 on the tract of land called La Solitude at Martillac in the canton o La Bride a hospital annex containing 125 beds had continued for 30 months when the report was presented to the Academy on April 2d 1917 and had met with the to the Anademy on April 2d 1917 and had met with the most remarkable success, partrularly in the case of patients who had been previously accustomed to agricultural labor. The implements employed were merely the usual simple tools used for farm work the hos, the spade the rake the plow the wheelbarrow and so forth but it was found that these could be made to supply, singly or in combination every possible stitling or form of exercise required for the restoration of function.

The obvious advantages spring not only from the surroundings of fresh air and more plentiful sunlight, but from the fact that the prescribed excresses continue over 1700 use fact use the prescribed extrates continue for many hours daily instead of one or two and this without over-fatigue aince there is no constant appeal to the attention the movements depending largely on the reflex system which is physiologically almost inac cosmile to fatigue

The greatest benefit of all perhaps is due to the continuous pleasurable interest arising from the achieve that normal delight

continuus pleasurable interest armsu from the ment of tangbie imprisonal results that norms in productave work felt by all healthy indi-viduals I is of course requisite that eso-patient should have the nature and amount of his work carefully inversibled by a competent physician who must see that the labor involves the required motion of the part affected prothe required motion of the part affected pro-portion the effort to the strength and fix the hours of labor. He must also see that the patient down not substitute short cuts by tening other muscles. Thus a man with a stiff right arm might get more work dome by using his left arm but the real purpose of his labor would thus be folled. The director thus sums up the benefits accruing
The result of this truly physiological form

of therapeutics of this functional resducation, have been most satisfactory set for the wounded men both physically and as regards their morale for the country from both the military and the economic point of view As to morale the entire mental outlook of a hospital patient the entre mental outlook of a hospital patient is changed by work in the fields. Physically his general health and his cardiac and pulmonary functioning keep pace with the rapid decrease of the local disability. From the multiary outlook 80 to 90 per cent of the men have been restored to service. Finally an economic gain in achieved by the very sounderable amount of supplementary farm labor thus secured.

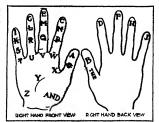


Curves showing extent to which France gave her wounded agricultural employment

Subjoined is a diagrammatic curve showing at a glance the number of days of agricultural labor obtained by the institution at Martillac This came to 30,000 working days furmished to agriculturists in the two cantons of

### A Talking Glove for the Blind-Deaf

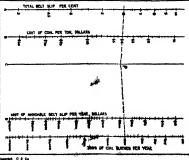
Fit is a problem to keep a blind person in close touch with the world about him what shall we say of the difficulties of communicating with one who is at once



Talking glove for the blind-deaf, which makes it possible to carry on a touch conversation

blind and deaf? Yet such persons are always to be found bune and dear: we stank persons are aways to be touch here and these, and they are communicated with after a fashion. Helen Keller and others have been able to read thes with their fingers, and in a recent actiole in these pages a deaf-blind girl was mentioned whose associates converse with her by "writing out their words, in ordinary service and a letter at a time on her palm

For some years as a result of the war we may expect to have among us rather more than usual of those doubly afflicted unfortunates. Accordingly it may not be out



This chart beats a slide-rule for finding the cost of belt-alluness

of order to draw assemblem to the farther seguingual by a Communicat Yashee, Dr. Walliam Navy of Amelian has most his swar amply! approaching blushees and district answer. Dr. Terry's "tabling glove" is not new in in his new to the swar of the state of the word by means of an Aphabet Jonalised on the Jonales of the finger, and it has been suggested that the scheme is wastly older than even this. Past Dr. Terry a layout in perhaps as satisfactory a one is could be employed, and it makes provision for all the letters of the present English alphabet, which is not the new with all of its professors. And Dr. Terry at least some with all of its professors. And Dr. Terry at least for this to talk with total strangers who were not acquainted with his system. This feature community has present this feature community in the state of the processors. for nim to task with total attraggers who were not ac-quanted with his system. This feature consists in a thin giove, marked with the letters in the locations which had been assigned them. When the doctor had made a new acquantance, all he had to do was to draw its this giove, and he was at once acquipped for converseigns

### Steel for Guns

Steel for Guns

Time metallury of gun steel has been greatly sitered as a result of the war. This is particularly lens in this country and is probably more or less so in Essjand of France at the war dever to a close, steel for large guns was being mode in a radically deferent manner than the country than the country that is an asseption of the country than the country that is a seepled fact four years ago or less that only and speak-march as of country that the country that is a seepled fact four years ago or less that only and speak-march steel outside to a safety incorporated in ordnance guns. The plants especially built in this country early siter our entrance into the war, adopted this process. The reason for this policy was that it as possible to make the policy was that it is possible to make the policy was that it is possible to make the produce a best of the policy was that it is possible to make advantage involved, however, is the length of time to produce a best of such seed it all such work the complete decondation, the formation of the proper sings, and the refinement of the most consume from its to 15 hours in the case of a 40-or 50-ton heat with the utenest care accountry. As the development of the confiamous program of the United States progressed it was found beauch bottom, could and this produce gun reside round, if not superior to that made by the long-drawn-out acid once-hearth process

neade postoris, cettur and tid produce guz sress equas, in not superior to that made by the hing-disam-nost and open-hearth process. While a 8-per-cent nickel etsel was the standard alloy incorporated in many of the guss, it is stated that at one of the large British plants a plain cashoo that at one of the large prisons plants a plant andexnon electron steel was giving entire satisfaction in the last months of the war. An interesting report, also, is to the effect that mone American plant gun seed that me ordnance specifications satisfactorily was being made in basic open-hearth furnaces—a steel that was taboosd for guns before the war and later.

for guns before the war and later
It is probably a fact this had the war continued much
longer the electric furnace would have been the first
electric furnace would have been the first
it was even being scheduled for one of the later pleate
it was even being scheduled for one of the later pleate
and thus use, not so much perhaps because of the stope
onty in quality over and open-inerth, but because the
same amount of suitable metal on ab e made is about onethird the time In prosecuting a war, time counts

### The Cost of Slipping Belts

THE graphte computer, which enables us to lay a ruler across a group of scales on which our navanage

data are laid out and to read then the answer from the ruler a intersection with another scale,

from the reler a intersection with another easi, as now a familiar freast. We have shown several examples in those solumas, and may perhaps be foreynen if we show another. As appreciable items of preventable factory waste is belt slip. But until he known just how much his belt slip is sorting him a manufacturer can hardly go very far toward as prevention, for these is no gain in appendiculation for these is no gain in appendiculation for these is no gain in appendiculation for these is not gain in appendiculation for the second of the second ower engineer

in a power engineer. If the total persontage of belt fifth to the II the total persontage of belt fifth the marked or like A and the average price pied for coal on line B, there will be determined a peint. P on line C. If this point P be them jugued with the proper point of line E, on which is pletted the annual coal consumption, it will cut line D at a point indicating the agginal coat of the belt sip nuisance. Our figure aftern the problem worked out for a page entirely from air per cert slip, and burning 1,000 were of coal per years at 84 per ton. The coat of the belt slip is here men to be no less this all 00 per assum, in guite of the rettiee mindi assile of operations inclinated by the low fuel

### ing Freight Care of Concrete

CONCENTE is rapidly becoming a castverest statemal Bach day, so the same that the same but one that promises to be far

The beginning of practical plans for the manufacture of reinforced concrete freight cars dates from 1909 when a patent for such a car was granted to Joseph B Strauss of Chrosgo On account of the war, con of Chrosgo On account of the war, con struction of a trial car was delayed and it was but recently that the first car of the was our recently state the irst car of the gondola type, was complated by a Chicago company and tasted under service con-ditions. Not only in the material used but in its design and the details of construction, it represents an interesting de-parture from usual methods

The basic feature of the dougn is a steel on body forming the outer boundary othe car, and mounted upon a steel under-frame. The concrete walk and floor are contained within this frame and together with the frame and floor reinforcement are comand interlooked with the underframe. The steel frame forms the finishing and protective edges thus entirely shielding the concrete and also serving as a complete

shielding the concrete and also serving as a complete system of stress-bearing members the comment gun In the construction of the test car the comment gun was used. The forms were placed on the outside of the sar, and the comment was shot against them from within The outside of the car that is the surface against the forms, was given a smooth finish but the interior was left much as it came from the gun Tests of the completed on; both empty and loaded the contraction of the contractions. In the

Tests of the completed ear, both empty and loaded demonstrated its practicability for rough service. In the test without load it withstood extremely rough handling in switching, and came through without nigury "ub-sequently, she car was loaded with 55 tons (10 per cast overloads) of and and turned over to a switching crew for service handling. It withstood this test also without

for service handling. It withstood this test also without injury.

Other meeties actioned for the concrete one. It will not seed patients and will protectically eliminate maintaneauce changes. Re life will be much longer than that of the receive one car. It will knew the important advantage, able, of bang unaffected by the cargo, and will assessmently be estipated botter than the wheel car for successmently her estipated botter than the wheel car for form the second of the

### Zoppulin Shads in Occupied Germany

NE of the great draw-backs to the extensive supply ment of dirightee in the past has been the matter of stating Huge daughties, such as the Expenden, call for use sheak the construction and maintenance of which is large item of expense. De-tire the draw-back, however, as dirightee as a type has of

the drawback, however, ingible as a type has of single considerable favor set Britain and America, use of its numerous mil-and commercial possi-

pipal of the huge sheds and to house directions Sepisitin shed shown in decempanying illustra-which is located at a in the American Some Occupation The men motor tricks about the of the shed serve to give e of the abed serve to give to idea of its size. The it of this shed commute of cost of this shed consume of gal-ness immediate doors of gal-axised iron, brased at the set by a stitutly sheet france-city as shown in the smaller ary. The doors around our-self on their binges, and ere apparing at the free and on



concrete gondole car which is now undergoing severe tests

### The Current Supplement MORF and more the engin er au i the manufacturer

Are coming to realize h w much the increscope can tell them of the normal ant abnormal structure of metals of the causes of failure even if the manor in which failure operates. But it a never easy to use the which failure operates. But it a never casy to use the microscope and sometimes the special difficulties of using



One of the Bent doors of the shed



Supposite shad because at Truves, Garmany, in the occupied part of the former empire

it in a given case are truly formidable. It the current issue of the Scientific Ameri CAN SUI PLEMENT No 2257 for April 5th some of these difficulties are set forth with suggestions for meeting them in an article suggestions for meeting them in an article cuttide. The Mer secope in Metal Study which pays special it features and illumination. Another discussion of interest to the it alluspriate to Corrosso. Of Brease in Sea Blate. The account of Radio-Altavity secontimesed from the previous issue at 1 w ll to completed in a shared metallicity. third installment An aller cut of the-way corner of the country who is stood be of interest to more than the magnificant number of tourists that a tailly find then way to it is described in I ost ( ity as will be way to be desirated in The Try as will be interest this is a canyon city of the cliff dwellers. An excellent soon it to the pre vious works discussion of balance i rations will be found in The Mineral Elements in Annual Nutrition by a momber of the Ohio Fxperment Station In somewhat lighter vein is A Scientiff Can Problem which comes from no less impressive a place than the Philadelphia Mint Analysis of the Mechanism of Speech discusses this subject

Mechanism of Sperch discusses this subject more thoroughly than we real having seen it discussed muee the advent of Bell a formidable disboration of it into an alphabet of raishic most hygymmatics. The Testoning of Paper touches upon an important industrial problem while Tadanies for Natives. Super and Marris tires to show how nature carries on manufacturing-operations of her own. Furthers short articles of interest will be found for own. scattered through the pages of an unusually well balanced number

### Rustless Steel Invention

THE romance of rustless steel one of the most recent metallurgical triumphs is given increased prominence with the removal of control. The new metal with a THE romance of rustless steel one of the most recent bright surface and able to resist the corroding effect of air water and soids without staining was discovered just prior to the outbreak of the war and was immedi ately commandeered by the British Government for use in airplane construction and for purposes where strength and durability, combined with rust resisting qualities were invaluable The steel is a Shefileid invention, and was chanced upon largely by accident A local metal lurgist Mr Harry Brearly author of numerous standard works was experimenting in the armament shop to find works was experimenting in the armainent snop to muo a means of preventing crossion in gin tubes. After some of his experimenta is noticed that cartains pasces of chromic stell had not suffered from contravey influences under conditions which would have rusted ordinary stell under conditions which would have rusted grammary sice! He followed up this elue and what is known as stanless steel was eventually worked out and added to Sheffield s metallurgical triumphs. It was applied to manufactur ing outlery

### Kiln Drying Oak for Vehicles

ONT of the distinct developments of experiments conducted at the Forest Products Laboratory at Madison Wis during the war was a rapid method of sessoning oak

It requires from two to three years to air season heavier oak wagon stock Better stock has been accured by drying this heavy green oak according to Forest Service recommendations and the

time for d-inch material green from the saw is reduced to 90 or 100 days

Three large plants using this system have negligible losses as compared with losses at plants using other meth ods which range from 10 per cent up to complete loss Where there were heavy dry ing losses there was heavy pressure for relaxation in in spection so that poor drying meant not only an excessive loss of stock and a holding on deliveries but prob ably also prorer material in

Wagone One furniture plant with orders for spare parts that followed improper drying methods is reported to have inst \$25 000 worth of stock on one run stock which was being depended upon to keep the force at work

# Servant to the Peoples of the Globe

THE progress of the peoples of the world has followed the spread of machinery around the globe

Machinery frees men's bodies from irksome tasks. Their minds then turn to larger thoughts and larger usefulness. Producing power expands. Life itself grows more abundant.

But machinery cannot make its way without correct oils and efficient lubrication service.

To enable the machinery of the world to develop its highest efficiency, the Vacuum Oil Company has provided both the correct oils and the scientific service.



Correct AUTOMOBILE LUBRICATION

**NEW YORK, U.S.A** 

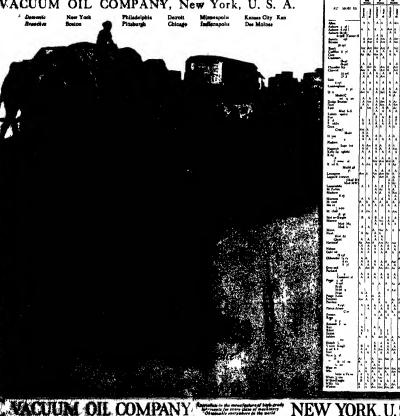


Today, Vacuum Oil Company branches dot the earth From these branches men familiar with scientific lubrication serve each nation's users of machinery. Power engineers the world over have come to look to the Vacuum Oil Company for advice. At all ports of importance, stocks of Gargoyle Lubricants are held ready for every lubricating need.

in rendering such service, the Vacuum Oil Company has become a sement to the peoples of the globe. As conditions demand, this service will be extended. As new lubricating needs arise, they will be met.

The work must go on.





## Inventions New and Interesting

A Department Devoted to Proneer Work in the Arts

### An Ironing Machine for Wire Rolls

I N working with roll wire reinforcing In working with roll wire reinforcing the concrete contractor has un doubtedly experienced a good deal f difficulty in keeping the material fit and straight. It is a good deal if the six sort of game as handling photographs which have spent simil days roll it is mailing tube with the special aggravation assured by the broches. caused by the breaking or bucking of single strands or mishes. To straighten out a badly twisted rell by hard in vives a great deal of time and some very distantoful work

We illustrate a handy little device that ta'ces 'his unpleasant jeb out of the work-man's hands and does it for him. I he and of the reinforcing roll is inserted between the two rollers and the wire is pressed out smooth and flat in its passage between them just as clothes come out of a wringer in a state of complete flatness It will be noted that the rollers are provided with adjustable bearings so that more or less pressure may be applied,

### A Speaking Tube for Airmen

COMMUNICATION between passengers in an airplano is a necessity especially in instructional and military work. Because of the roar of the engine work Because of the roar of the engine and rush of wind convorsation in the usual sense of the word is interly impossible and telephonic or other signaling systems must be resorted to Of late there has been introduced a most ample means of communication in the form of a special speaking tube which is the subject of the accompanying illustra

tion

The airman's speaking tube is the invention of B F Missaner a well-known radio engineer of New York (try I the at once simple light, confortable efficient, and comparatively inexpensive It weighs less than three pounds It employs neither delicate net hansins batteries, nor electrical connections so Datteries, nor electrical connections so that there is nothing which can get out of order. Being built into excellent and popular types of soft leather helimets and possessing earpiects of the list design this speaking tube arrangement on he worn for hours without disc unfort

The Missaner speaking tube has been successfully tested on various types of aircraft, including the most powerfully motored airplanes. In use the holmet should fit snugly so that an airtight con tact will be made between the ear necessity of undue tightening of the chin straps. This is very essential in order to keep out interfering noises and prevent wind rush is very important especially in high-speed machines. This applies both to listener and to the speake the listeners head is in the air stream the wind friction develops a powerful roar which makes hearing difficult if the speaker s mouthpiece is in the air stream the air rush will set up interfering noises in the tube that will also make hearing difficult The windshields ordinarily provided give the necessary protection speaking the mouthpiece should be held close to but not tightly against the mouth if held tightly against the mouth he and law movements are interfered with and also the voice sounds are muffled A moderate voice intensity gives best rosults even though the speaker cannot hear his own voice A moment s testing when starting a flight with low medium and strong voice intensity will quickly and at which is the best procedure As will be noted in the illustration, the speaking tube affords but one-way communication. For two-way communicitim two sets of speaking tubes and belimpts are meet



This simple speaking tube arrangement permits of carrying on a conversation in any airplane



Taking the kinks out of reinforcing wire



A machine that prints circ complete, with address and signature

### A Universal Printing Machine

THI filled-in circular letter is an old-time friend. How many times do we ind it in our mail with name and address staring at us in violet from the

top of a bright blue selling story! On perhaps the contrast is between blacks a sickly thing that looks as though it might anothy thing that looks as though it mides once have been a gray, and a brilliairy not black or shiny blue-black, trying to to last the thing one from his same source. Sometimes the pathetic effect to make good the deception of a personal letter, to us slone of all the millions, is distributed by the standing an eighth of an inch above or below its at single special property of the letter has been above to below its at single special property of the letter knows by heart the difficulty of making likes make the distributed on the standard of the section of

this problem. He knows that nobody is going to pay the same attention to the opening paragraph of a self-convicted circular as to the same section of what might, on appearances alone, he a regular letter, and be know only too well that that first paragraph is the one with the knok, the one that must "go over" if the entire letter is not to fall fait—and fall flat on its faces in the water. -and fall flat on its face in the waste-

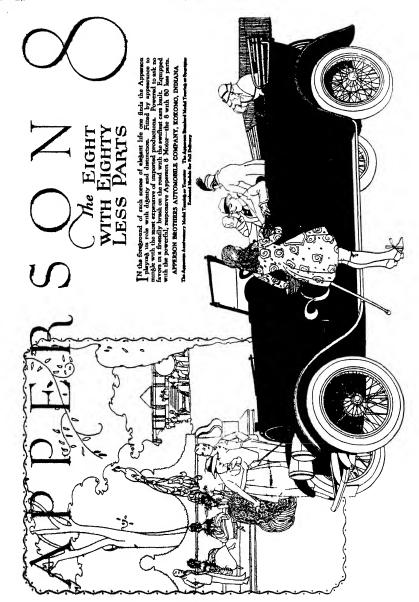
ne 10 years ago Mr E E Strawn of Some 10 years ago Mr E E Stearm of Des Moines began working on a machine for process letters that weedf not go attright to the jude-man; and this select to improve the appearance of the fill-the has been the idea belief and its more than a work which the best had been the fill the resulting the selection of the fill-the had been the selection of the fill-the had been added, of their we have here really a new the selection of the fill-the had been added, of their we have here really a new the selection of the fill the selection of the selection

was archable slow of mechanism.

With this mechan a letter in printed in one solor, a different name and underse in printed on such letter in the same solor, and in séculial si se since a letterbad di wassed) and a signister an interchad di wassed; and a signister and pranted at the same operation, in the same of the same such as the same of 5000 letters per hour.

To do thus of course the machine uses paper in rolls: This in itself means a great saving in the buying of supplies are assuing in the supplies, which in this respect the machine practically duplicates various others which we have seen The entered the same since one as a time, and discharged hack into an inserechangualist drawer in the patter is advanced from the sall il inches at a stam, this beging the largish of the letter preduced. While the paper is at a stational till his body of the letter is guished from a comprise of supresse guine sur une up on a sight bud mish a correspondent of types

shed ribbon between it and the typic and the every appearance of a kype written letter is biblished—in fact, we get a letter that is truly typowytens though by michina hit the same open-ties a name plate is breught into pertian; and ame and address are printed, along with the body of the letter, through the same ribbon Of outures is maches—how on it help nearching? Aid by the panel tolkin, unless these occurs dome in



### Recently Patented Inventions

Brief Descriptions of Recently Potential Machanical and Electrical Desicus, Tools, Form Implementa, Elec.

CAL SPRIFFS 227 W. Coal St. Minnaud dash I as Fin investible in lakes outperfails to a cap for one by uniforce fifer une name when presented in the cap for one by uniforce fifer une name when the cap for the cap in the c

NURSING BIDISI S M Krowsky 96
Johnson Ave Bookish N Y | Inia invention
relates to woman's garmonts its object is to relates it wouldn't gainford the object in to provide a minding flows which in its general appearance is the an relinary blonse but can be readfly opened by the uner for nursing purposes. Another object is to linear a desired privacy by covering the breast and the infants head

covering the former and the influent a lossed TREASH RE CMREIKE I N. Yamouson 20th Fifth Av. N. w. York. N. Y. The object of the forvation is to 1 ovide a remainer carried elegand to 1s worst undermost in the outer gaz-person, and arranged or renth in course arranged to the worst particular to exactly size in valuable in money and other articles and over the same on the body thus reducing and over the same on the body thus reducing the same of the results of the results and other the same of the results of the results and other the same of the results of nthorized persons Another object is to pockers it which the valuables are stored

### Electrical Devices

RECORDING APPARATIS FOR USE IN CONNECTION WITH ADVERTISING DE-VICES AND THE LIKE—HI & BARRIN 98 VICES AND THE LIKE—HI & BARRIN 98 VICES AND THE LIKE—HI & BARRIN 98 TO HIS INVENTION PROBLEM TO HIS INVENTION PROBLEM TO THE STATE OF THE PROPERTY OF THE PROBLEM TO THE STATE OF THE PROPERTY OF THE PROPERT mechanism for use in connection with devices for exhibiting publi announcements advertisements or the like in which the mechanism for forming or the like in which the mechanism for forming litters or symbols to is exhibited are set by electrical impulses transmitted from a sending station. The olipter is to ranble the various settings of the advertising apparatus at the exhibiting station to be recorded and permanent details preserved it is affording a theck upon the

### Ol General Interest

Of General Interest

EXPOSURE Melica—G. M. MILNER
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The Invention: late vio a photographic ligne
exposure racet: omeriding a shaded strip a
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through and where it is the stand or the same is varied means associated with the strip whereby the shade of the same may be matched with that of the streen, and scales fixed for indicating the

VEGETABLE GILE OR ADHESIVE -VFGGTABLE GIIK OR ADMESIVE— BW T. reserve I. Now 6th '4' P. Diladelphia ha An object of the invention is to provide an ad-which vegatable abhorieve are applied. Another object is to davies a method of obtaining the object is to davies a method of obtaining the product which is an appearous as if it definitions the machiners necessary for hydrodyring the starts. The addition consists of 80 per cent of toor grant tactions. 30 per cent of hist grade-cent of the start of the start of one spacer of one pre-cent of the start.

DISTIAN FORM F T PALMANERRO care of t it lalintubers Sons 65 W 36th 9t New York N Y An object of this invention is to I improvements in display forms whereby or is natled to readily adjust the form to inst is ret over these in case the noor of the will we thereupport is mever or inclined. At it of he has to permit of adjusting the dis-play tim relative the shows or other footwear to he means a cretises when using footwear with bots fediter n heights.

FIY SCREEN C C TREDWAY Valedon New Mexico This inventor relates to screen for 1 sers or windows for evoluting files and other FIN VARIETY (C. TRADWAY Validon N. WALLEY WALLEY WAS A SECTION FOR BOWLING ALLEYS WALLEY WAS A SECTION FOR BOWLING ALLEYS WALLEY WAS A SECTION FOR A SECTION

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instructions are produced to the composition of t g fistures in cast iron the best results a with 60 per cent suffer and 40 per ec

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leaf pits and of a construction to afford sample
support for the dressed half and maintain the same in a siven form

RESPIRATOR MARK —N SONWARTE, 261 W 34th St. New York N Y The object of the invention is to provide a respirator mask more especially designed for the use of persons working especially designed for the use of persons working in dusty places and arranged to protect the time against inhaling dust or indecities and contaging diseases liable to be contracted by inhaling dust containing bacteria of a pathoneach assure Another object is to insure a using it of masic without lindering free inhaling and exhaling, and to prevent chains of the skill.

to prevent change of the same PINGER BAC ENVELOPE—4 P King-HNGER BAC ENVELOPE—4 P King-haura mere of Cohoes Frivelope Co Cohoes. N Y Among the principal objects of the invention are to provide means for currying a bag by a finger halt to provide means for severing the bag in closed position to provide locking means for the lag with may be quickly and readily operated and to avoid tearing the bag by the weight carried therein

weight carried therein.

COPPEE STRAINER—L DAWREE 325 E 141 St New York N Y The inventible base for his general soldpeet to provide a construction of the process process of the process of the process process of the p

In pouring out must pass through the straines.

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FIRPAIM —W E Rosenner Appleton Wis This investion reases to recoil Operated breach touting automate hand freemen. As object to tailour early assuming any and the place without the use of botts arrows or demilier heatural gentrees. A further object is to permit the use of long and about artriders and interchangeable herein for firing a carridge of different caliber, and to resturt to the permit of different caliber, and to resture the time and

WANHBOARD—H RAKER ASI Main St Dickson City Pa Among the principal objects of th invention are to avoid breaking wash-boards when the rubbing portion thereof is constructed of glass and to relieve a board of the structed of glass and to relate a board of the character mentioned from damaging shock occasioned by accidental dropping of the board. The device comprises a washboard having a glass paner as dwooden side members and a plurality of helical apring buffers in service relation to the

THREAD CUTTER -M A MEAGER THREAD CUTTER—M A Manouss and E bis M: New York N \ The object of this invention is to provide a device in the form of a cutte mounted on a ring to be worn on the finger of the hand of a sensitives store astendant or packer arranged to form a convenient means for pacter arranged to form a convenient masses for cutting thread var twint or similar massessial is sewing packing or like operations. Another objects to permit the owner to readily remove the cutter from the ring for resharpening or replacing by a new one.

DRINKING FOUNTAIN --- R B RODGER DRINKING FOUNTAIN—R B ROGRAMS STATES (AT 15 THE ATTENTION PROCESSES AND A CONTROL OF THE ATTENTION PROCESSES AND A CONT

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SHUT-OFF VALVE FOR GAS AND OTHER STUT-OFF VALVE FOR DAS AND OTHERS PIPER—W B. ADMINIST, 100 I 18th 8th, New York N T The invention has for an onlyed or the piper of the caused to close and masses for receiving a look on that the video may be often despite in anthorized opening, the device may be erroughed in bytich piper of the piper of the piper of the layer of the piper of the piper of the piper of the piper of the layer of the piper of the piper of the piper of the piper of the layer of the piper of the piper of the piper of the piper of the layer of the piper o

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New York, N Y The investion robuses to tolice accessaries in chapte, is to provide a holder for a shaving breath or a south breash and five conveniently holding the breash and a factolle such suitable with paste to be used in conjunction with the breash and suitable position to the contract of t

OH. OAN HOLDER — 8 B Cornan and E C Mirran Nabriba, Kina. One of the principal Objects of the invention is to provide a holder for all man adapted to be connected to an automobile horrester [conceive or other vesicle, the device including scenar whereby the container may be channed in place while not in me so as to be accusedy maketaland against injury unused by "comments with towards." OH CAN HOLDER -8 B COMMAN and B MINNE Saboths, Kens. One of the princips

DRAWING BOARD ATTACHMENT—R
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object of the invention in to provide an attachment which may not in different capacities for ment which may not in different expecient for couping a comparatively small board on supply the requirements of a large board Another object is to provide swinging arms which may be used for supporting acticles, and also used for indicating the vanishing point when drawing perspectives or erry

perspectives or are:

BOTTLE HOLDER — CATEMPRANERS. 252

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porties to be supported directly by the anrounding hot or crate

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ANIMAL TRAP—P D and D E Warm,

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Indicated to measure a percept marking translation to control in the mode or due. To designed sever OLL ONN ENGLISHES—C. A. Dr. Macterian, in the control of 


# Working on the plans

Sometimes it's a hard job; you'll enjoy a Lucky Strike cigarette—there's nothing more delightful than the famous toasted flavor. It's toasted

LUCKY STRIKE

The real Burley eigerette the flavor developed an emphasize the company of the com

the flavor developed and enriched by toasting like buttered toast Do you smoke a pipe?

Do you smoke a pipe ' Then Lucky Strike tobacco same formula it's toasted

It's toasted



349

RECENTLY PATENTED INNENTIONS (Continued from page 741)

REFIRATION 1. W. W. W. AND THE REPORT OF THE RECENTLY PATENTED INNENTIONS
(Concluded from page 244)

RESPIGATOR N % inwarez 251 W 34th
8: New York N 7 This investion has for the
object the provision of a respirator more supersially
designed for the use of (resons evolving to the
object has provided in the control of the page 250 m and the
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the being the provided interlevity with a pock t dataport t. v out has an absorbest
the being the provided interlevity. the body having an outside dust shedding pliable member of textile material

### Mardware and Tools

ROTARY DRILLING 1001—1 W PIPPIN BOX 380 Oklahoma Okla Fibe of 1 to ftb inwention is to provide a role adapted for work known as rotsey hydraulic jetts pro-cess whech acceptanting and contracting the newvided together with supporting mechanism therefor for consequence with supporting measurement flock of for cooperating with the bits to hold then it nex-panded or contracted position to it away the earth beneath the easing of the rite casing for withdrawal and wherein mechanism is provided for locking the to the casing to constrain the

BOLUTION FOR RUSTPROOFING AND NUT LOCKING.—C D MATHEWS P O Box 745 New Orleans La. The Invention whates to a solution fermed of ultric solid acctic acid and a solution furned of nitr's sell actic acid and common sails with which lift not not a terretested an oxidizing coating will be formed on the sur-hoo of the object transic. I like noid prevents water descriptation of the loon or seel and thus serves as a temporooling anisate its affect of the atmosphere on the from or stell. The solution can also be used for belong nature or lotte by forming an oxid on the interesseding threads chereby preventing the nuts or acrows becoming loosened by vibiation etc. but permitting their removal with a wrench whon desired

removal with a wreat whom desired.

DOULLOK K.—I. HAWKER NV I respect Ave slow York N. Y. Among the principal objects which it is diversition has in view are 1 provide a look adjustable for le har released by a key to provide means for throwing a but operable as both addes of a stoor to privile an adjustment at one side of the lock as arraneous that the best may not be operated from the operate olds threed and the provided of the control of the con-

and to simplify the ronar-ut of m WORK HOLDER — P. J. Bays. 307 K. 504 S. New York. N. Y. The invention rotates to the control of the control of the control of the for second wave, an object is the provision of a construction for holding an article of any shape to that sew may pass there-through substantially on the sew may be supported to the control of the further object is to provide a holder in which a loosely mounted rings is positioned on a sphere or balf-sphere with clamping members for carrying the works to that is shifting the work the rings is

### g and Lighting

OIL BURNFR —J F REILY Central Aguirre Perto Rico This invention relates to oil burners which may use crude off as well as refined oil the oil being sprayed with stoom in



A LONGITUDINAL VERTICAL BE TION TEROUGE

order to so ure high efficiency. An object is to order to scure man enterency. An object as or provide a burner having a steam and oil infet with a mixing chamber and spraying shamber adjacent its discharge mouth so that the cil will be heated sprayed and mixed with steam substan. stally simultaneously

Machines and Mechanical Devices SLICING MACHINE—A STAIRER 234 E 12th St. New York N.Y. The Inventor relates to a combination bread and meat sli ing machine to a combination bread and mail mill into mid-like object is to provide means for insuring the circuit to provide means for insuring the circuit to provide means for insuring the circuit of the typic in the insuring the circuit of the provide means for insuring the circuit of the typic in the circuit of t

reducing waste to a minimum reducing wasts to a minimum PACKING POR TURBINES—A Borrow, Cuttual Bidg Paterson N J This invanisher relates to a packing severable from the size of a rathus, as diet inguished from a packing secretal from the size of a rathus, as diet inguished from a packing secretal report of the packing packing and the packing and packet as to present of a packing and opice its to provide packing members retained against their seat under a satisfurement of a packing and opice its to provide packing members retained against their seat under a satisfurement of a compressible final.

withdrawal and wherein mechanics provided for the classification of the content o

A todicted speed ATTACHING ATTACHING ATTACHING ACHINFS—E G DAVIS 117 Week Made St Madison in all the object of the investice is to provide a device ospecially adapted for use in the Changes nose self-bet by prescribing the change to be made from the bather or balls to provide a device ospecially adapted for use in the Changes to be made from the bather or balls to read the change to be made from the bather or balls may be required without the deadminest of access of the life

EDUCATION PIPE FOR AIR-LIFT PUMPS—A W PI see mas Wortow Herkham, Albby York Fugiant Fish invention has for its object to provide a simple and inappearing pipe whereby in efficient yof the lift pump is greatly in reased by reduring the loss by high-surface velocity and contracted water passage-WRYE

ROLL POLISHER —F Warrens, 601 W 12th St. Dove (blo This invention relates to a too for the polishes the time and the state of the state

ICE CREAM CONE DISPENSING MA-ICE CRPAM CONE DIRPENSING MA-CHINE—R. II PROPER uses of Benjamin 1984 Welster Av. New York N Y The Invention relates to a cultur-controlled methelm especially de-signed for delivering ion cream in an edible cone yield of the control of the control of the control vision of a simple and efficient charge measuring devices where, by a definite quantity of loc erasm is delivered each time the device boding composed of coppositely acting rates and a scraper the upper gate being closed while the lower gate is open, so that the fee cream charge can drop has a cone placed heliver the spects of the position of the control of the placed heliver the spects of the position of the control of the con

PITMAN CONNECTION -E NORSOW 214 Size St. Prooklyn N.Y. Among the objects
of the invention is to provide a simple strong and
durable connection between an outline piston and
the connecting rod for the crank shaft of an engine the connecting cod by the craim shart or an engine More specifically stated the object is to provide a pitman connection which occupies a minimum amount of space with respect both to the direct connection and the clearance provided for the ociliation of the pitman

oscillation of the pitman

NAFITY GAGP I LASS — G Enser 44 Oakind I crace Newsch N J The invention
colates to space these for science bollers or sides
analyzons machines Aroung the objects in to
provide a fun or type of shild serving to so
surround the glass moore as to make it a practical
impossibility for particles or glass to fy said
evidence may prevan in the vicinity in the avent

REFRIGERATING MACHINE -8 R Bate REPRIGERATION WAG INING— BE BRAZE, licenament Texas. One of the main objects of this invention is to provide a double-judged other cylinder barding as sile contained expansion tank for the refragerant whorely a violatively great cooling area is provided with a relatively amail displacement in the cylinder and a brubble object is to provide mean for insuring the ser-cutation of the brine through the cylinder

STYLUTO AND HOLDER FOR THE SAMES.

C A MILLAR 168 Hamilton Phere New YestN Y The investmen relates to photocrosphie and
similar sound reproducing nucleities as sphotocrosphie and
shad richotals to permit the use of a single-sing in the
spaint in a large snuckey of records, saw about
wants before requiring a changes. Another
object is to cannot the positio of the explan to league
smallmently in contact with every portion of the
second provote thus administrate all screenings. offer to and overtones

Frime Mewvers and Their Assessments
ATACHMENT FOR INTERNAL COMBURIOU NOUTRES—A. W. THEW. AIL
BURIOU NOUTRES—O. W. THEW. AIL
BURIOU NOUTRES—O. W. THEW. AIL
BURIOUS CONTROL THE INVESTMENT AND
AUGIN S. HORSOO, Tense This investion has
for its object to provide an alternment adapted
for connection with investal recombustion engines
of overy character for heating and vaporising
faul as for insidence guardine and knowness and the like and for vaporising water to supply mixture of air and steam to the fuel mixture

### Pertuining to Vehicles

Previousness to Vabilities
AUTOMOSTILES 2010ALD J L. Nonroor
100 N 316 Ave. Present. Art. The invention
100 N 316 Ave. Present. Art. The invention
had for its oblett to provide necheslams adapted
for two first in the present of the control of
the unital property of signal is provided
erranged at the rear of the vehicle and no connected to the brake operating mechanism that
when the mechanism is opposited to brake the
whole that the vehicle in question is about to
stop or clock its speed.
NON NAID MELENTENT CONNECTION.

NON SLID ELEMENT CONNECTOR -wheel structure

LOW ITVEL INDICATOR AND ALARM
A NEAL 11 to Nomeron: E Ottaro Ontario
Canada. The invention although adapted for
Canada. The invention although adapted for
canada. The invention although adapted
in a connection with the genetities and of an automobilit to it wind an alarm upon the passion
continue a non-terminded low when of The invencertaine a non-terminded low when of The invena pass rithe and a float thought coreline with
measure to automatically idea an afaire deriult
upon the liquid is the pages reaching a prediupon the liquid is the pages reaching a prediVEN PILLATOR ST. D. Denesyan and H. J. LOW I IVEL INDICATOR AND ALARM

ter involve love loved Vernita-TOR—H D. Dromman and H J Proversa 487 E. Columbus 81. Austron Oblo The object of the invention is to provide a simple face; casive ventilabiling device for automobiles, when his the feet and lower limbs of an operator of an automobile may be provided with a sufficient quantity of from the origin to the fore-part of the automobile may be considered to the contract of the sufficient quantity of from the confine into the fore-part of the automobile hot below the coult

RECORDING DEVICE -H W ALEXANDER RECORDING DEVICE—H W AREADOM TO STREET BY A The invention has for its object to provide a recording device adapted for use with a vehicle and to be driven by the vehicle to record the profile of the surface passed over by the vehicle. The device com-prises means for supporting and moving a strip of paper longitudinally, and a marker mounted to move transversely of the strip.

to mon transversely of the sirlp
THR CARRIER — J. F. KRILLT Grand View
Are Far Rocksway N. Y. An object of the
invariant is to provide a title carrier for automobles which has means for locking spires irres
thereon so as to prevent unautoberied presence
from tempeting with the tirus. Another object
is to provide a dovice which can be seally secured
to a motor vehicle and which is particularly
adapted for the near end of the voldies.

adapted for the rear end of the values SIGNAL LIGHT POR SIGNAL LIGHT AND REAR LIGHT POR FILE AND LIGHT POR SIGNAL LIGHT POR SIGNAL LIGHT POR SIGNAL S

acrow and attract attention

RADIATOR COVER AND TEMPERATURE REQUIATOR—W M Essenow, Duthat Minn. The irrection relates particularly
to a cover for radiators of automobiles and other
machines embodying engine cooling systems
utilizing radiators the object is to provide measure
abovery a cover normally in insarter position and

meedful.

BIONAL — P. Farenza, &ps. 708.

Luis Foxes Meedeo Tale hevention :

to a signal for use on assembled and
which resilient chappers or temperature of a recor and by their reservice against or
elegents produce a classical gross are fixed products as to provide a signal of an important or
concedions the sound-producing elements:

"execute signal."

visual signal.

PROCESSO OF PREPARING TIRE TREADS

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STOP SIGNAL FOR AUTOMOBILES—A
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This invention release so automatic algunal
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provision of a signal which is adapted to be
applied to be seen suring must guard or body,
which will be not a signal which is adapted to be
provision of a signal which is adapted to be
applied to be seen suring must guard or body
word. Show and floy operatively connected
which shows the signal when the the behave and the
word Stop when the behave and riby as: STOP SIGNAL FOR AUTOMOBILES .

weed 8top whose the brackes are fully set PUMP ATTAGEMENT—J W DUMP Doug-les, Aris The invention has for its object to provide an attachment repectally adapted for consention to an air pump of an automobile in such manner that the pump will be operated by the turning of one of the wheels, the wheels being saleded up for this purpose.

passes up for this purpose.

SPOT LIGHT—US S. Berkinson: 2318 Broadway. Oakhand Cal. The invention relates to a spot light for motor vehicles as moremate that it can be directed as any desired point. Another chiefe is so provide a year light with means for manipulating the same with the knee and thereby directed or say desired spot which is within the analysis of the light.

angle of the light.

LOCK FOR AUTOMOBILE STREETS
WHEELS - I F DATIGON But 164 Duncan
Obla. This investion makes to locks for submobile recetting whose the special object is to
provide a lock of the permutation type by means
of which a whool may be boxed to the security
column or released therefrom thus preventing
temporing with the automobile by unantipricate

RRAR AUTOMOBILE SIGNAL—O O MOBILE TO THE PROPERTY OF THE PROPE REAR AUTOMOBILE SIGNAL --- O

DESIGN FOR A FINGER RING —P BRHAMIN, care of Louis Levy 200 Broadway New York N Y The invention has been granted patents on two designs.

DESIGN FOR A BODY OF A STRINGED MUSICAL INSTRUMENT —V R. LEGUE, 50 BOOMEVELS, New York, N Y

DESIGN FOR A DESK CABINET.—R. P. PRAWLEY, 159 E 90th St. New York, N. Y. PLAWLEY, 100 E WORR IN New YEAR, R Y.
DERIGN FOR A COVERING FOR DOLLS,
CALENDARS, FADS, BLOTTERS, CARDS,
ON SIMILAR ARTICLES,
507 W 19618 St., New York, N, Y
DESIGN FOR A GAME BOARD—R
CRESTED 500 W 10748 St., New York, N, Y

We wish to call attention to the fact that was in a position to render competent services in overy transch of patent or render competent services in overy transch or patent or renderate work. Our safe is composed of mechanical electrical and chemical experts, thereash trained to present and presents all patents applies thous. Irrespective control or of the special distributions. Irrespective to the control of the special distribution of the presentation of patent shed excluded, who assets in the presentation of patent shed included, who assets in the presentation of patent shed included and the presentation of the control of the contr



Simonals

# Further Evidence of the Superiority of Keystone Copper Steel

Actual time and exposure wrought these results. This is but one of multiplied instances that show the excellence of the copper-steel alloy. Does it prove rust-resistance?

These two sheets were exposed side by side for exactly the same length of time. They were identical in manufacture—the same gauge and from the same best the only difference being the ALLOYOF COPPER.



Galvanized Roofing and Siding Products as formed from Arollo-Kavarones Copper Steel Galvanized Sheets five unoqualed service Keyanos quality a sloe supplied in Black Bheets Roofing Tin Plates etc. Demand this material for all exposed sheets with the Company manufactures Bheet and Tin Mill Products of very descriptions and for every known purposes.

AMERICAN SHEET AND TIN PLATE COMPANY, General Offices. Frick Building, Pittsburgh, Pa.





(Continued Jones page 247)

Zhipple Creek district about 780 Seet.

The total datebargs, with star steal vertical animatenees fadientes the land server of the continued of the

by water Shafts sunk below the tunnel level will no doubt, encounter water, but this will require pumping only to the tunnel intel is stead of to the surface

inst in stand of to the surface "It turned has been connected by raises with fur of the principal mine shafts of the Cripple Creek district. These are the LI Place Pikton Crosson and Portland compraise shafts Several important latticle also have been driven. These used set the Plulie cross-cut in the LI Pace ground 750 feet long the Naven-Beacon Hill drift about 300 feet long the Crosson Hill drift about 300 feet long the Crosson and the Criston of the Portland Latval connecting with the United States of the Portland Latval connecting with the United States of the Portland Latval connecting with the United States of the Portland Latval connecting with the United States of the Portland Latval connecting with the United States of the Portland Latval connecting with the United States of the Portland Latval connecting with the United States of the Portland Latval connecting with the United States of the Portland Latval connecting with the United States of the Portland Latval connecting with the United States of the Portland Latval Connecting with the United States of the Portland Latval Connecting with the United States of the Portland Latval Connecting with the United States of the Portland Latval Connecting with the United States of the Portland Latval Connecting with the United States of the Portland Latval Connecting with the United States of the Portland Latval Connecting with the Portland Latval Connecting wi feet and about 2 000 feet long

One of the greatest engineering feats ac-complished during the boring of the tunnel was irrying the 2 000-foot lateral from the was inving the 2 000-foot lateral from the man; tun cli to reto connect with the Port-land \ \_shaft | It must be remembered that it is ground had to be surveyed at a det it 2133 feet and the lateral was not built a straight line but a sories of angle. I ber was much speculation among thus, in terested over how near the lateral wo li cine to connecting with the shaft E B I mens engineer for the Portland son j u y had charge of this job and when the lateral was finally connected they came

the lateral was many connected any came tog the rin a perfect fit.

It has ny of the undertaking was filled with rounder from the start because all numers believed that the next round of shot must I ring to light some fabulous ore An I with all its basards and unfavorable worl is g conditions not a life was lost in the

beveril veins and dikes were cut in the tun 1 Of those at least three carry ore of g id values. In the Cresson lateral s lirg body of good ore was opened about 400 fe t s uth of the shaft. This is now being d veloped with excellent prospects. A v 1 of high grade ore was encountered n ti Portland ground not far from the Ne shaft in the Rose-Nichol property a v i was cut about 60 feet east of the shift yilding good ore Many other ven's if low grade ore were opened and and if it ily will be exploited at some futu time

to 1 luiders and their bailed in an idea It 1 a rejuvenated the antire Crapple Cer g ld camp and while the camp is not like te it gold rush days it is getting back t a larger production Operators air h have heen saved many thousands of doll s over their assessment for the work and I velopment of the lower levels is to dr idly according to well informed

### the Prevention and Cure of Hookworm

(Continued from page 234) vers i us Gulliver characterises as 'the den a ls of nature are met in large com-munit sof semi-civilized or wholly savage unskill d labor are difficult for us to visuaire Y of it is supprising to see how such a manufact respond to the sufferts of the workers It might seem a hopeless task to educate a group of South Sea, islanders to appreciation of the sumisary.

SCHENTEFIC AMERICAN minin Point Oller Note. Builder of interest in investment and particulars of in

MUNN & CO. BYERE Trivial Pro

### Classified Advertisements





### Danish Wholesale Firm

wants sole representation for Scandinavia in electrical and technical articles, copperwire, interruptors, measure instruments, etc.

Denshandel, Copenhauer.
Densk Manifelia de



goods of a men's wear sh commends the Boston Garter.
To may be sure that the policy
the dealer is to give the cuser full value for his money The ton Gartor is first in quality and in service. Ask for it.

36 conts and spward in leading stores from seast to cont.



### T= NEW MIDGET SLIDE RULE



has many suclu re features is will add and subtract fractions and givedecimal equivalents it will also multiply divide add and subtract solve problems involving any root or power (excepting —1) and will give Logarithms and the

CELSON SLIDE BULE CO. NELS, MICH





OT only because crude and feel ask are cheaper, but some missent quality is always

BESSEWICK OIL ENGINES

worm; but it has been done. In one district of the Seychelles Islands for instance, every one of the 740 houses now has an approved latrine, though only seven were so equipped when the work began The suggestion that this statement reto European residents can easily be des posed of by cling the lact that for in entire archipelago the white population is but 600 And what has been done in Seychelles has been done—in small areas to be sure but none the less effectively for those areas—in the West Indes, in Sum in Costa Rica and Niearagua, in our own southern states Perhaps in the last named locality the problems of the workers were as acute as anywhere, boestuse here there was to be combatted not alone popular ignorance and indifference but actual hostility against interference with those areas—in the West Indies, in Siam actual hostility against interference with the liberty of the individual. Yet in 66 of the 300 communities in the South where this sort of work was conducted within a certain period not a home was left without an approved latrine the percentage of houses so equipped before the campaign was, for these communities 76

So much for prevention In addition it may be news to a good many of our readers that a specific cure for hookworm has been that a specine cure for nookworm has been in use for several years. The campaign against the post has had more or less publicity but we do not recall that this particular aspect of the case has as yet n touched upon in any save medical been touched upon in any save medical publications. The facts are, really, some what amusing The worm occupies the intestine the logical remedy is therefor to cause the patient to evacuate his un welcome guests. But the worms are so firmly attached to the walls of the intestine

firmly attached to the walls of the intestine that they resent with great success the action of ordinary supratives. In this dilemma it occurred to the Rockefeller institute a searchers that if the worms could only be paralysed, they would lose their grip and be passed sauly enough. Two drugs were found which have this happy effect upon the parasites while at the same time producing parasites while at the same time producing no serious results in the case of a patien who was suffering from no organic weak ness aside from the direct ravages of hi hookworms So the program of treatment consists of a dose of thymol or of chenopodium-just now the latter is preferred-to reduce the worms to helplessness, followed by castor oil or some other purgative One treatment is seldom completely effective but the most virulent cases have yielded to three or four, at appropriate intervals In fact based on the proportion of worms harbored to worms removed, a single treatment of chenopodium is found to have an off ciency of 96 per cent

With sufficient time and sufficient funds and sufficient workers, it is accordingly well within the possibilities that the Inter-national Health Board which is conducting the anti hookworm work, will succeed in the practical eradication of this long-standing menace What such success will mean to the world is suggested by the estimate of an engineer who places the discovery of this transment second on the list of benefits to the human race which have been contributed by individual members thereof since the dawn of time

### Hunting Submarines with a Sound Detector

sound contact with the fleeing enemy The graphic chart published berswith will indicate to the reader, the ability of submarine chasers to maintain sound contact with the enemy and the efficiency of the direction qualities of the devices

### Chasing a U-Beat to Its Death

The engagement which it illustrates The engagement water it interrates cocurred one early morning in the English Channel A small squadron of submanne-chasers discovered an ensuy craft moving sizely up the Channel submerged. Forming for the attack they rushed over the spot where their listeners indicated the



\$4.00 \$4.80 \$5.00 \$6.00 \$7.00 & \$8.00 If you have been paying \$10.00 to \$12.00 for fine shoes, a trial will convince you that for style, comfort and service W.L. Douglas 37.00 and \$8.00 aloes are equally as good and will give excellent satisfaction. The actual value is determined and the retail price fixed at the factory before W.L. Douglas name and the retail price is stamped on the bottom. The stamped price is W.L. Douglas personal guartantee that the shoes are always worth the price paid for them. The retail prices are the same everythey cost no more in San Francisco than they do in New Samuel the vice acceptance of the same everythey cost no more in San Francisco than they do in New Samuel the vice acceptance of the same everythey cost no more in San Francisco than they do in New Samuel the vice acceptance of the same everythey cost no more in San Francisco than they do in New Samuel the vice acceptance of the same everythey cost no more in San Francisco than they do in New Samuel the vice acceptance of the same everythey cost no more in San Francisco than they do in New Samuel the vice acceptance of the vice acceptance

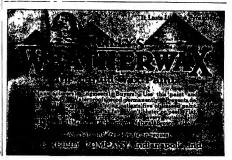
Your no more in San Francisco than they do in New Stamping the price on every pair of above as a protection against high prices and unreasonable profits is only one example of the constant on-deaver of W.I. Douglas product is guaranteed by more than 40 years experience in making fine shoes. The smart styles are the leaders in the fashion centers of America. They are made in a well-equipped factory at Bruckton, Mass., by the leghest paid, shilled shoomakers under the direction and appreciated mea, all working with an heaset determination to make the best shoes for the price that money can buy.

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### HOTEL DEWEY WASHINGTON.

N order to meet after-war conditions the DEWEY HOTEL, situated in that exclusive residential section, at 14th and L Streets (5 minutes In Inat exclusive residential section, at 14th and L Streets (5 minutes walk from the White House), has opened its doors to transent guests walk from the White House), has opened its doors to transent guests for many years the Dewey has been the official residence of Senators and those prominent in official life of the Capital. The accommodations are limited, and only those whose presence will be compatible with its clientele will be secrepted. It will be best to make reservations by letter community, and the property of the property

TRANK P FENWICK



# BLACK WALL

MONARCH of the FOREST

acres) will produce an income or stown AS A ROAD SIDE TERE. It studiepen der the mest adverse conditions, pro Uninstavan on rough land worthises for AS A LAWN TREE, It san at

Ten pounds of 1 e to abell d fro a bushed of nuts sold at the per pound



# The Value of Suggestion

In a recent interference proceeding involving five separate applicants for a patent, three of them attributed their conception of the invention to an illustrated article abpearing in the SCIENTIFIC AMERI-CAN. By placing before your engineers, designers and mechanics for systematic study, copies of patents, you may stir their inventive faculties to your great advantage.

We can furnish complete sets of United States Patents -- properly classified -- relating to your particular line of work in convenient form for ready reference. Write our Manufacturers Service Department.

### SCIENTIFIC AMERICAN

U-hoat to be, drupped a pastern of depth bombs and then withdrew to take observa-

Peverish activity and the sound of hammers ringing against the ship's side was heard. The submanne motors would then start up and stop, start and stop

Further attacks were delivered and mor noise came to the inteners from the hold of the submarine Evidently the first depth charge had taken good effect and depth charge had taken good effect and the enemy a crew was making a last deeper-ate effort to reach the surface. Then there was a diad sleene broken at last by 23 sharp reports like revolvers shots. The crew, giving up in deepair, had committed suided. The lose of this submarine was later substantiated by the British Intelli-sace. Description.

When Capt Leigh and his party went abroad in November, 1917, he requested the Admiralty to loan him two high speed the English waters but was finally obliged to accept 3 trawlers of 9 to 10 knots speed, of the scarcity of higher speed craft at that time

Equipping these vessels with all of the anti-out marine detecting apparatus, they went out in the Laglash Chainnel on New Years Day 1918. Shortly afterwards a wireless: cessage was picked up from an airable groung the position of a submarine which had just been seen to submerge The Clant Chad been laid out in numbered squares t facilitate the immediate location enemy craft and the little squadron steamed ver got their devices out and picked up the submarine s course

When believing themselves about over the enemy depth bombs were discharged and later a trawling instrument was used which it di uted that the submarine had been destryed. Great quantities of oil e of the attack

Remaining in I nglish and French waters for several months where the American devices proved of great value and were highly complemented both by Admira Sims and British Naval Officers another squadron was equipped and sent into the Mediterranean and Adnatic where at this time submarine activity was at its

The Barrage Acress the Straits of Ot Because of the deeper water and less interference from surface traffic listening conditions were unusually good. A bar-rage line of boats was organised across

ato Straits between the mainland and the Island of Corfu to put an effective stop to the enemy s free entrance to the Medi terraneau

The Corman submarines leaving Pola rere abliged to go through Otranto Straits to get to the Mediterranean and once through they had things practically their two way as there were very few patrol boats in the Mediterranean. The tonnage mk during the first three years of the war hows the condition that existed before the

Otranto barrage was put into effect
Our submarine chasers while on barrage were constantly in sound contact with emy submarines especially at night, as enemy submarines especially at hight, as they usually attempted to get through during the dark hours. They would run down on the surface at their maximum speed an! suld be heard for an hour or two before they came to our line. The dif-ference of sound between an oil engine and an electric motor is so marked that it was comparatively easy to tell when they chaiged from one to the other which was necessary as soon as they submerged As they knew approximately where our line was they invariably submerged two or three miles before they reached the linear

makes before they reached the larger. The course of the submarine was plotted to stable by the flagship of a unit from bearing large given to its from the other two heatest and also from its own bearings when the submarines had also from its own bearings when the submarines had approached sufficiently industry along the bearings when the submarines had approached sufficiently industry along these lines; wheat the submarines had approached sufficiently and manufacturers ours to the submarines of the submarines and the submarines are submarined to the submarines and the submarines and the submarines are submarines and the submarines and the submarines are submarines are submarines and the submarines are submarines and the submarines are submarines and the submarines are submarines are submarines are submarines and the submarines are submarines are submarines are submarines are submarines and the submarine

Three of the chase tion abreast one dark a marine approaching. I tained by the two beas directly toward the o directly toward the middle boat now he approaching from a pos The enemy came neares finally passed right under the av a wave of water along the

When the German had pas out in front, the attack was made in an a pattern of depth bombs was "that and the little fleet halted for further" vations Pretty soon the whir? submarine s electric motors, was evidently in an effort to rea surface

Then came a crunching noise not w the popping in of a blown up paper-bag
It was apparent that the submarine had been damaged, put out of control, sunk and that she had collapsed nunk and that she had collapsed from the tremendous water pressure at these depths

Many merdents of this kind occurred during the subsequent operations in foreign during the subsequent operations in foreign waters and several submarines were ac-counted for through the direct aid of the American lutening devices

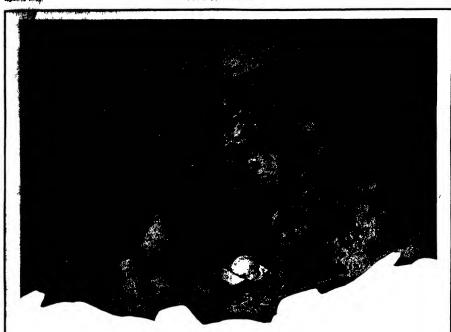
In fact, naval experts who a in touch with submarine detection designent during the war period, etate, conviction that if the conflict that timued through another summer, the sufmarine would literally have been driven from the ocean the promuse of a condit due in a large measure to the perfection o submarine detecting apparatu

It has also been stated that the notice able change in naval tactics—from defe ave to offensive—which marked this; country a surfame into the war was largely; caused by the application of American principles to the pursuit and attack of the U boat something made possible by the practical use to which it was found the American submarine detector could be put.

### Foreign Trade in Furniture

EVERAL phases of the war and peace-time activities of the Forest Products Laboratory at Madison, Was, have a bearing on the problems of shippings furniture overtean These cover the con-ditioning or preparation of the wood to sud-the climate to which the furniture will be the climate to which the lumiture will be east the use of waterproof glues, kiln drying, boxing and crating for overseas shipments, and possible treatments to prevent depredations of wood destroying insects. While information is at hand on general principles, the application of these principles to the needs of the furnitus industry has never been studied, and can not be undertaken without the cooperation

In general it can be stated that furniture manufactured in the north central states will check and open up when sent to desert regions, and that its wood will swell, the regions, and that its wood will swell, the glue joints open up, and the veneering come off when it is sent to trapical humid regions. Exact knowledge of the climatic conditions surrounding the use of the furniture at its destanation and a reproduction of these conditions in the factory through the control of humidity in works rooms, should offer the ruccessful solution of this problem. This would be coupled with consideration of drying the lu the proper mousture content, and shipment in moisture-proof packages to insure



# The Finger in the Dike

WHEN a whole countryside was menaced by a great disaster a frail human finger saved thousands of lives and mill ons in property. People went about their daily affairs never dreaming of the impending catastrophe or of the tmy finger that averted it

Today milions of people work and play and sleep and est totally unconscious that fin gers in the dike are serving them and protecting them in every waking and sleeping moment.

The trolley or train that carries you to your daily occupation would stop dead were it not for the rugiant fingers in the disk back at the power house—stopping the leaks by keeping the joints tight and making possible the manufacture of power

Fatal railway accidents would be frequent but for the fingers in the dike that keep the air pumps tight so that the air brakes will in stantly respond The elevator which lifts you to your office would not respond to the control of the oper ator if the fingers in the dike were not keep ing the plungers packed tight

Electric lights would fail water in kitchen and bathroom faucets in fire hydrants would not flow it somewhere the finger in the dike failed to serve

You never give a thought to these silent and hidden fingers in the dike

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ctivities point to further expansions into other related fields of industrial changatry

E. I. duPont de Nemoure & Co. ed 1802 Wilminston Delewers

### Exploring by Airplane (Continued from page \$87)

nt holds a level position regardless of the swaving or pitching of the plane. The exposures are made automatically, the number per minute being regulated by a gage The instrument is operated by a spring, which is wound by hand The camera holds a roll. The instrument is operated by a clockwork driven by a spring, which is wound by hand The camers holds a roll of 100 films laken in succession, as the plane files the photos would reveal a panorama of territory nearly 50 miles long that is if the exposures were made at an average height of 8 000 feet. From this it is obvious that rivers could be mapped with a great deal of accuracy

When our late African explorers such When our late African explorers such as Invingstone, Stanley and Roosevelt went into the Dark Continent to study the flora and the fauna and to bag big game nors and the tauna and to bag big game they had serious obstacles to contend with in the way of transportation. Progress was slow and the greater part of the travels was made on foot. There were long caravans of natives carrying supplies, etc., but even these could not reach all parts of the vast jungle, where danger lurked on every ade Airplanes were unknown quantities in those days and if some one at that time had mentioned the possible use of a flying machine for exploration work he might have been dubbed a dreamer of the wildest sort But times have changed and it is my firm conviction that in the near future we will find the naturalist hunter soaring over the jungles of the wild country and with either a rifle or a machine gun

bag his elephants from the air I hat this is no idle speculation but a that this is no idle speculation but a perfect possibility I gained from Mr Charles Cottar formerly of Oklahoma but lately of Nairobi, British East Africa He went to Africa in 1910 and muce ther has ice ome quite familiar with the jungle where he went big game hunting. Since made three trips back to the United States maid three trips back to the United States to beau supplies Mr Cottar did not let the war go through without seeing service. He was a houtenant in the In telligence Section of the British I zpodintonary Forse for 14 months serving as a secont. Its left Uganda October 20th and Decumber 24d Mr Cottar look. The work of all his hunting trips and these, he asys the will proterve as a record for hus family he will preserve as a record for his family

I called on Mr Cottar shortly after his arrival in New York and saked his opinion on the airplane as a transportation medium on the airplane as a transportation medium, in exploration work I found him very enthusiastic over the idea and he said that he wished many a time that he had an airplane when hunting elephants. When these animals hide in the tall buffalo grass, which is higher than the elephants, it is hard for a hunter to approach them Mr Cotter said that elephants in droves of 1 000 or more are found in this grass idea would be to fly over the herd and then blaze away with a rife or a machine gun at the animal selected for prey After the herd had been frightened away, it would be an easy matter to venture into the field on foot and take charge of the

mine mine inine inine mine inine mine inine inine inine inine inine inine inine

Conditions in some parts of Africa are such according to Mr Cottar, that the simplane could be used to desirable ad vantage in reaching places which hitherto have been maccessible The following is lis statement on the subject "From urobi to the Abyssinian border, a distance of about 325 miles, there is a first class automobile road which has been used for military purposes On each side of this road we have what is known as the North frontur country, and this is partly deser and a very large area of it is unexplored It would be easy to use this road as a bar for airplane trips into the interior of the country and from my knowledge of the

land, there are open spaces on which landings onuld be made.

'Then again there is a railroad running from Narrobi to Lake Victoria Nyanaa, and after this has been crossed by boat the



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journay could be continued by a good truck road for a distance of 165 miles to Fort Portal Nine miles distant from this town we have Mt Ruenson a peak of about 16 700 feet The summit of this mountain is seldom seen on account of the clouds that constantly hang about it Southwest of Mt Ruenson is a vast un explored country and by looking at the map you will find no markings as to what a person may find here. This should surely offer a most promisingly fertile field for the explorer

Forty miles south of Fort Portal is an open and flat country the elevation above sea level being not over 3 500 feet. The grass here is not much over six inches high in many places and it would be just what an aviator would want for landing and starting his machine If an airplane could fly a distance of 200 miles from this point and return the aviator would have an excilent opportunity of making ob-servations over a country which as far as I know no white man has ever seen before This is the territory that is known for its savage dwarf like canni bals and the home of hig game Elephants are found by the thousands not mentioning lions tigers and other beasts of the forest

I believe a hunter while in flight could bring down a tusker without any trouble. The battleplanes in Furope have flown over trenches while machine guns were spraying lead on the enemy Apply the same tactics when after hig game and you are bound to get something. The flying machine could also be used for carrying an animal like a killed hon or a leopard from the interior to a highway or a railroad for transportation

As before stated the type of airplane used for exploration work would have to be of a different design than that used for commercial or military purposes I will give a description of a twin motor tractor triplane designed by Leon N W Colin a young aeronautical engineer of New York and which he says would fulfill the requirements of a plane for the explora

The machine which is the cover subject The machine which is the cover subject of this issue would have a span of 77 feet a length of 4d feet a maximum height of 19 feet gap between the wings six feet total weight 600 pounds useful load 5800 pounds and it would be equipped with two 300-horse power engines. The machine would have a minimum mileage of 850 miles 10 hours range of action and it could reach an aktitude of about 20 000

Its landing speed would be 30 miles per hour. The fuselage is six feet high four feet wide and 40 feet 6 inches long. It is mounted between the center and the lower wing I he tanks are located in the fuselage also compartments for carrying supplies spares and cargo amounting to a total weight of 2 200 pounds. In front is the open pilots compartment and back of him the enclosed compartment for two

The span is 75 feet the center-section is 16 feet wide and the wings are hinged thereto so that they can be folded back wards to occupy a small space. When the wings are folded back the machine requires a road width of 33 feet for travel ing from one point to another The located on the upper and center planes and inter-connected

The landing gear is of the double-wheeled V type with a distance of some sixteen feet between the skid portions

Three stanchions in a vertical plane of each side of the center section under the motor are the features of the chases supporting the machine Two additional stanchions brace the fuselage diagonally to stancions prace in electronic angularly to the chassis and the wheels are so mounted as to permit the change of its vertical airs with respect to the nature of the ground, and its irregularity Rubber cherd is used as shock absorber and it is enclosed in a housiage in order to prevent entangling



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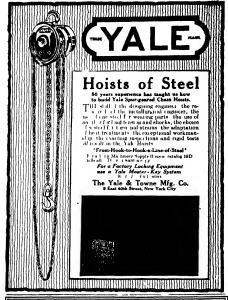
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in the grass. If the machine is landed in high grass there is a maximum distance of ax feet provided before the top of the grass ax feet provided octors the top of the grass will found the wing center-section. The tail skid is designed to give as little ob-struction as possible in high grass. The skid is of the savied type, to prevent racking the body in side landings. Rubber chord is used as shock absorber

A liplant tail is used The tip counter belan ed decators are hinged to the stabilisers and three counter-balanced rudders are the support of the upper stabiliser plane one in the center, and one on each side in the center line of each motor. A which is provided in the cockpit to change the angle of incidence of the stabilizers If the machine lands in high grass and the motors are running, the stabilisers are put to their maximum angle of lift in order to carry the weight of the tail. The inchne I stabilizer as to aid materially in its rusing Upon clearing the grass the The muchine is able to fly and climb with only one motor running

### A Universal Printing Machine (C minued from page 846)

multifit if operation that stops the

pl (

the accomplished, the paper moves
firm rl 11 nucles bringing the next
length in position in passing forward
the listance it passes through what
am unto to a cylinder press, and it takes
in pieses in from two electrotype plates—
out for the letterliead, one for the signature, aut araph or otherwise After it stops again at the end of these operations it is cut off to a length of exactly 11 inchesand there is the complete letter Pro-vision is made for a double printing of the letterhead so that part of this may be in, an red and part in black, while at the same time the signature may be in any ook r at all in fact, the only huntation to the four-color effects obtainable is that the fill in must match the body of the letter, being printed through the same ribbon

In addition to this operation of printing filled in circular letters, which is what the filled in circular letters, which is what the machine is primarily designed for, it possesses other capacities. It can be convicted into an ordinary printing press by the shifting of two gears, cutting out the ribour-printing mechanism. The paper their flows through the machine continuously without starting and topping and letterheads order blanks, laundry tackets, hand bills, etc. may be produced at from 5-1990 to 50 000 per hour Again, with a very simple attachment!

Again, with a very simple attachment we may convert it into an envelope machine which makes a complete en-velope barring one fold of the flap which velope must still be done by hand. The envelope is crossed and gummed ready for the fold and at the same operation is directed from the drawer of address plates, and receives the return card in the corner. The same speed is here attained as in the case of the rcular lette

An interesting added feature is the An interesting added leature is the ruling device A set of ruling pens is mounted over the web of paper, which of c urse always moves in the same plane ily propor settings of these pens, any desired longitudinal ruling may be obtenned, and as the paper flows through the machine cross-rulings and column hadings are printed. The primary pur-pose of this is to make possible the printing of order blanks, but of course many other varieties of business stationery can like-

possible to rentificte the triangle or proposed to their extent. The fact remains that up to the per-

The fact remains that up to the present the public have nothing most share to assertion on the part of the advantes of the Canal Street project that is, and the ventilated, and it would be a great again faction to all concerned if the magnitude investigation of this very vital matter sould be published in full This would certainly be more satisfying to engineers and to other interested, than the delivery of invective and indecide of those that have the termerity according to those that have a treating to question the particular point. The statement was made by Mr O'Bagirle in the daceauon that the figures made by the writer of the artsie in your issue of August 4th, 1917, were based on the friction that would be encountered in the rough bore of a mine, and without attempting to refute this statement, any one who has in the least considered that vital question must 4t once have deended that the wagods and autors positing the tunnel full, would and according to the control of the contr

The writer is one, who like Mr. Landen thal, is anxious if the matter cannot re ceive an unbiased investigation and report serve as unbussed investigation and report, to see the tunnel quickly built to arrive at a practical settlement of the whells bentroversy. The remark of one principles angineer that it was better to build ane small tunnel at Canal Street, and interest, and interest. others at points above this location in order to prevent the congestion that storid order to prevent the conjection that wright follow the completion of the grappesed bug tube, applies with equal force to the trying out of this matter of ventilation on one small tunnel before spending so much of the public funds in what is most surely

of the public funds in what is most surely an experiment. The writer hopes that Mr O'Rounke will be allowed to build the sunnel, if it can be determined that the best interests of the two states will be best served by auch a means of carrying the traffic across the Hudson, but I believe with Mr Forgic that the figure named by Mr Forgic that the figure named by Mr O'Rounke as about 50 per cent too low, and of the contraster were involved in such a first the contraster were involved in such as the contraster. to see the states drawn into any

CHAS E FOWLES, Consulting Engineer

### Fuel from Household Waste

A METHOD of utilizing ordinary household refuse has been invented by Mr Reginald Brown (President of the Institute of Municipal Enginetts of Engineers land), who has supplied the following particulars. The process is in operation at

particulars The process is in operation at Southail, Middlesex.

It is claimed that the whole of the refuse collected from houses (such as ashes, unders, paper, straw, and vegetable matter) can be dealt with and turned into fuel, thus conserving the cost supply Mr Brown assumes that in a community Mr Brown assumes that in a community having a population of 100,000 there would be 25,000 tone annually of refuse, and he show that the sale of the prepared fuel even when marketed at a low price, 'would result in connectrable reviews and profit. On arrival at the refuse disposal secks the refuse is tupped into a crusher and reduced to a powder. It is then lifted by an elevator and made into small blocks by means of a braqueting mechine. No briefly gratering is added at this stage. From the braqueting machine the shoots are placed on carrying trays canalls of

varieties of business stationery can like and the state of the state o

of many enjoying value be required, the believes, instead of being disped, are placed in a sylinder and impregnated under

pressible.

28's pointed out that oil-tar is used bestiles, of its high disinfecting, calorid, unleaded by gra and Mading qualities, as it contains 20 locomotive cranes price in a first price i

On the question of cost the inventor states that the expense of conversion in pre-war days amounted in England to \$1.6% per ton while the vlaue of the finished product is about half that of best coal Before the war a plant capable of dealing with 34 [one daily would have cost from \$7,500 to \$8,760, including the buildings The latter would cover a space 75 by 32 feet, with a storage shed 32 by 20 feet Such a plant, turning out annually 6,000 tons at a cost per ton of \$1 82, would is about half that of best coal

f the briquets were sold at the low rate of \$2.43 per ton, bring in a profit of \$3 660, while an output of 25,000 tons annually

while an output of 20,000 rons annuary would net \$15,250 in excess of cost. The inventor adds that, besides being a means of providing a valuable fuel out of material now wasted the briquets can be used for domestic and steam-raising purcost of disposal The process is fully protected by letters patent in Great Britain and other countries

### Storage of Coal Under Water

THE October 19th issue of the SCIENTIFIC AMERICAN contained an interesting article on the weathering of coal in which under-water storage was mentioned as the safest method of keeping bituminous ecal. Most people who store coal are agreed on this, but while the Brunot's Island reservoir, illustrated and described sman reservoir, mustrated and described in the previous article, may indeed be the largest one deliberately created for the purpose of coal storage, it is by no coeans the largest pit used for that purpose A Kankakee, Ill., company has a com-

A Kankake, Ill, company has a comhumal regions the stock should never be used in
plets sub-equeous storage plant with less than 18 to 24 inches from the ground
doubt the expective of the Brunot a Island Wood blocking used in direct contact with
san abandoned immetone quarry was applied by offer the state being supplied by
an abandoned immetone quarry full or other durable materials. Treated aids
The aids of the pit are us receilent shape, the rock having been channeled The
storage expecting from 200,000 to 220,000. orage capacity is from 200,000 to 250,000 ma, the quarry being about 700 feet long tags, the small-aned product of the color of by 310 feet wide and 30 feet deep Screenings, the small-sized product of the mines, by a 75-horse-power motor, pump and motor being mounted on a barge that floats in the basin. The pipe line, 10 inches in diameter, rests on pontoons. To reclaim he coal, the proce es as reversed, the coal s pumped from the quarry into the conemis pil at the base of the inclined sievator. When this pit is illind, the water overflows back into the quarry. Coal from the pit sievated by a flight of perforated buckets through which much of the water drains, and is delivered nnto ears on the railroad track. Two thousand tone per night-hour day ona the unkeded from are into the quarry, and 1 600 tone reclaimed in the sense time. All coal up to three inches can be a first of the coal up to three inches can be a first of the coal up to these inches can be a first of the coal up to these inches can be a first of the coal up to these inches can be a first of the coal up to these inches can be a first of the coal up to these inches can be a first of the coal up to t

At Whiting, Ind , there is snother under-At Whiting, Ind, there is another under-water considerings plant even larger than the case just described. This pit, which was also crisically created for another purpose, \$4.1000 feet long, 200 feet wide, and 28 feet cleap. It has been lined with sconegie that first black on the hottom, with say, by the prior level wooden place \$60, then, her, the pides; these are me-rically also the property that is the concepts can-

ping. Four treeties carrying standard gage tracks extend from end to end of the pit, and there is a track on each bank parallel to these In this way arx trains may be handled at once The coal is unloaded by gravity and reclaimed by

A concrete storage bin of unusual design is located at Hilladale Mich It consists of a pair of reinforced concrete bins 28 feet in diameter and 78 feet deep Bottom dump cars are unloaded through a track grating the coal being then carried by a conveyor belt to a bucket elevator and dumped into the bins at the top. The bins are roofed and so constructe prevent the free circulation of air precaution against fire each bin has six 1-inch pipes set vertically, each pipe having an opening at the top and three intervals along the side With these it is possible to flood the bin from a pressure line in the event of a blaze

### Hints on Storing Timber to Prevent Decay

MAN) serious losses from decay in wooden structures are possibly duc to the fact that the tumbers used were in fected with wood-destroying fungi whil reduced by keeping lumber storage yards it a sanitary condition Strong efforts should be made to stor

the product on well drained ground, re-

high tides and standing water
All rotting debris scattered about yards All rotting debris scattered about yards should be collected and burned no mattri whether it be decayed foundation and tramway timbers or stored lumber which has become infected. In the case of vards aiready filled in to considerable with sawdust and other woody debris the attuation can be improved by a heavy surfacing with soil, slag or similarimaterial Weeds should be cut away from the piles

to allow good ventilation

More attention should be given to the More attention should be given to the foundations of lumb r piles in order to insure freedom from decay and better ventilation beneath the stacks Solid foundations should never be used in humd regions the stock should not be piled less than 18 to 24 inches from the ground Wood blocking used in direct contact with wet ground should be protected by the application of crescente or determined to the surface of t

piles will slope approximately one inch to every foot of length

back Instead of throwing the "stickers about on the ground to become infacted with decay, they should be handled carrfully and when not ru use piled on sound foundations and kept as dry as possible II pine, saturated with roun, or the heart wood of such durable apecies as what cak on the same and the dates of the da

wood of such durable speares as wate oax or red gum be employed, the danger of possible infection will be greatly decreased in storage shads the necessity for piling higher from the ground is very appearant in many cases. The same remedies apply here as for pile foundations in the open The sheds should be tightly roofed and the siding should not be run down be bottom of the foundation silis Free at ourculation should be allowed from a

circulation should be allowed from all sides beneath the inclosure Only throughly dry stock should be stored in slow piles under cover outbreaks occur in storage shade not constructed to meet sanitary needs the infected foundation thabers should all be form out and replaced with wood seaked as an antiseptic soligition or by considered to brick In all assess the needs





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By ALBERT A. HOPKINS

 $\label{eq:theory_to_theory} \textbf{E} \begin{tabular}{ll} \textbf{XTRACT from th. } Preface & Without holding a brief for either the prohibitions or those who wish to inanufacture innocuous beverages at home to the pros and the street of the probability will appeal at once to the pros and the sants for herein will be found everything from strong wine by identically described by the probability of th$ 

Book is affectively bound People all want this book. The prohibitionists like the hundreds of hialth giving heverages which can be made at him and the others want formulas which do not require atilise or other particularly or the brewery. The information contained will be of interest to all.

CONTENTS 13 For ed in your ader to-day for this way o

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foundations should be so constructed as to keep the lumber well off the ground, and the soil and timber immediately adjoining the soil and tumoer immediately adjoining the infected area should be sprayed or painted with an antiseptic solution of a water-soluble sait, like sodium fluorid, mercuru chlorid sine chlorid, or copper

A more detailed discussion of methods of handling lumber to prevent decay is to be found in Department of Agriculture Bulletin No. 510 Timber Storage Con ditions in the Eastern and Southern States with Special Reference to Decay Problems obtainable from the Superintendent of Documents Government Printing Office Washington D C price 20 cents

### Plant Fossils and the Past

THAI plant fossils are the keys which unlack many of the mysteries of former world conditions is a known scientific fact yet one which never losse its charm fact vet one which never mess as the mand freshness. Every research among these relics of a past life yields some new information of intense interest. It is now practically certain that fossils not only act as aids to the study of organic evolution and indicate climatic changes and old land surfaces but also outline former continental

When certain kinds of petrified plants are found in different parts of the world it is possel le to correlate their ages however far apart they may be I hus rocks of Antarctica are known to be of Jurassic age, since they contain fossil ferns which are found in the Juranese rocks of Furope great economic value in recognising strata
of rock which contain oil or valuable metals

If the same species of land plants ex isted in Antarctica and Furope there must have been a land connection between the countries allowing migration of these plants countries allowing migration of these plants from one place to another. The presence in the western part of the United States of fossil leaves of the Ginkgo or maldenhair tree now found only in Asia, is an indication that North America and Asia have leen formerly related no doubt across the Bering sea Similar evidences show past land connections between Greenland

the rocks of all these piaces contain im-pressions of the same vegetation for dogusts have called fossil plants thermometers of the past because they mark luations which ages ago constituted either tropic or arctic regions but which now have the mild weather of the tempernow have the mind weather of the temper-ate zone. When in Iowa and other middle western states leaves of the palm, fig magnolia and breadfruit are found mingled with the impressions of deciduous trees millions of years old it seems to be a fact that the region was formerly tropic Just as leaves which fall into streams today may eave impressions in the clay, so in the past falling haves pressed their outlines down The presence then of these petrified outmes must seem a conclusive proof of the

Rock impressions show that only the

neechs such as bees and wasps, at that the state of the concelling 
### Steaming of Vehicle Stock During Kills Drying

SATURATED steam as a means of alleviating the tendencies of green lumber to honeycomb in the kiln has for lumber to noneycome in the Emm sas for some time been successfully applied in the commercial drying of heavy vehicle stock Such treatment has meant the difference between success and failure in many tills runs It has afforded the means of overcoming discrepancies in operation or mis-

withstand rigid drying conditions
So far, however the steaming treats has been confined to straight stock contention has always been that bent stock such as rims, should not be steamed after removal from the form, expansions indicating that stock so treated would tend to straighten out to its original shape. The kiln drying of heavy bent rims has been carried on therefore, without resorting to steaming to remove casehardening and other defects of drying

Recent experiments conducted under the direction of the Forest ProductsLabors carection of the Forest ProductsLaboratory
have shown that judicious steaming of
heavy bent vehicle stock results in a conaddrably improved product and that the
operation can be accomplished without
serious effect upon the curvature

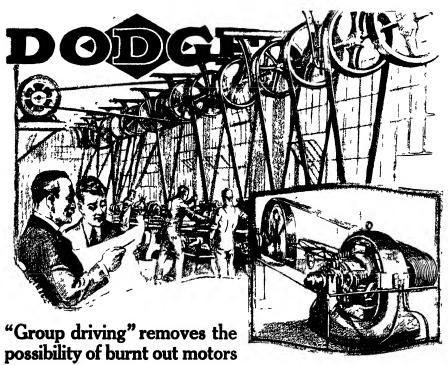
Careful judgment is necessary, however as it is a very easy matter to run the entire charge Contrary to the by too severe treatment by too severe treatment Contrary to see common impression, this steaming has been done at high temperatures (180° 180° F) and for short periods (18 to 8 hours) the temperature and time varying

according to the requirement of the case
The method was given a rather severe
test, being trued first on 50-inch oak rims
and later on 60-inch artillery wheel stock
When applied to the kiln drying of heavy
oak rims on a commercial bass it worked osa rims on a commercial main it worked out very successfully Checks in the stock before ateaming, which showed pinching in tending toward honeycombing, closed normally without damage after steaming Of 2 400 pieces, the losses attributable to kiln drying were only two per cent

### Resistance of Suspended Wires

past land contextions between the past land contextions between the past land contextions between the past land context on the west and North America on the west and Englishman, described some experience of the past of the past land to the past of the past land the past land to rent traveled upward, the resistance of a copper wire was slightly greater than when the current was flowing downward. In the case of an iron wire the resistance was greater for the downward current effects were so small that Bidwell hesitated to publish the observation he ascribed the changes to thermal (Peltier) effects

in the wires stretched by their own weight.
The observations are confirmed by experiments described by S. R. Williams, of Oberlin College, Ohio Williams suspended wires so as to form an inverted U or V, connecting the free lower wire ands with a Wheatstone bridge Such a wire would be more stretched in its higher portions near the point of suspension than below and a current would travel from The continuous properties of the continuous an unstrained to a strained portion up the one leg, and from a strained portion to nsects such as bees and wasps, at that had to use insulated wires (alk covered),



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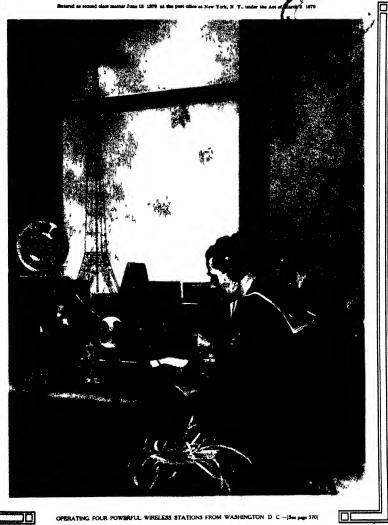
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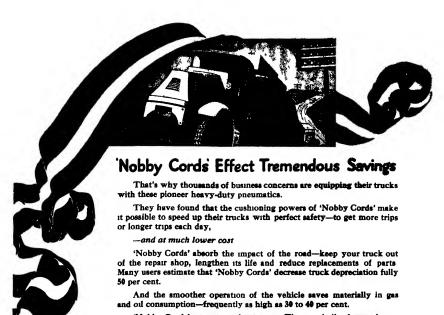
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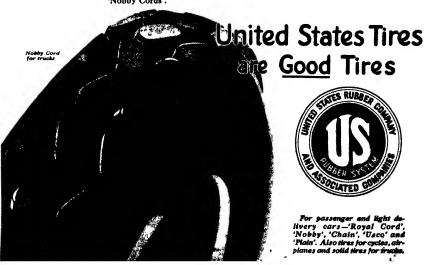




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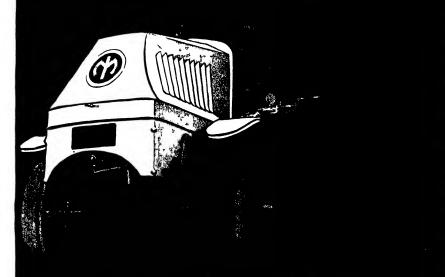
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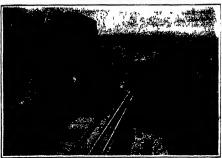
# SCIENTIFIC AMERICAN

### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

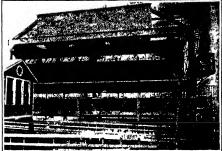
VOLUME CXX

NEW YORK, APRIL 12 1919

10 CENTS A COPY



General view of the elevator and two-car dumper at Sewell's Point, Va.



The dumper in action with two cars in the overturned position

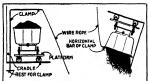
### The Biggest Car Dumper in the World

THE United States as the land of hig car dumpers our medium-nared real cars haul 45 50 and 60 short tons of cool, the gante used to a greater or less extent as the Norfolk & Westers Railway in hauling coal from the Alleghenes to indewster at Hampton Roads have a capacity of 100 tons. Naturally, then, the dumper must correspond But the Virginana Railway at Nevella Point, Hampton Roads, Va., has recently installed a dumper to handle 120 tons at a trp, without having been forced to this step by any increase of railrand coal cars to a sorresponding load capacity

to a corresponding lead capacity
The new matallation handles two 60-ton cars simulsanously Two loaded cars, standing end to end are
overturned adverse and their contents dumped
American dumper always operatory overturning the
American dumper always operatory overturning
matchines. These latter type the cars endwises. This
seconstates an end-gate on the ear to portant the discharge of the coal The Lengths typ about 70 degrees
which is an advantage, and are often able to accomplish
toping with skeleton equipment very simply operated
However, compared with the American giants, their cars
set for the most part almost two parts.

At Sewell's Point there are some millions of tons to be handled per year, so that high especity is of the utnost emportance. In about two minutes, the new dumper goes through its cycle of operations and dumps its 120

One of the most interesting things about a car dumper—the most interesting, perhaps next to the method of versturning—is the little cable car called a "mule a brazeng". I'm gound-hoy "Modern American ardunipers st, as a rule, elevated more or less ab. ve the general toward to the state of the dumper towards and discharge cost. There is a longer or shortest inclined approach to the site of the dumper, over when the smule punkes the one or more loaded cars which it is bringing to the oradle of the dumper I runs on the state of the sta



First and final positions of the carriage and car



Incline to damping philippy, showing transfer our

some conditions it has been found degrable not to depend upon gravity to return the mule from the top of the incline but to attach the tail of the cable to it and return it by power

return it by power. The requirement of overturning care sidewise in an American dumper is to run the loaded car out on the platform of an 12-shaped readle an after loading the whole to the desired lived, to overturn both car and credit. The I turns on an axis parallel to the junction line of the historical and the vertical parts of the reads in the first of the first

The new dumper at Hampton Bonds has a cradle long rought to receive two case. In addition to taking care of the great length it is also increasing to provide for marked difference in the body widths of the two care by dividing the platform into two sections. Care coming upon the cradle must be to a few transcapacity tween one case the space would be at monimum and with narrow mess at a maximum. As the overturn begins the load on the short kingth of rooks in the cradle begins to diminish and weight comments at come upon the normally vertical pixel of the L. This transfer continues until 90 digress of rotation have been completed at which moment the care will rest entirely in its side against this moment the care will rest entirely in its side against the short known quitting in a sudden shift of the loaded car at the bigning of the overturn it is customary to attain the side of the care of a stranger the short lingth of raiss on a movable platform. This platform rests on which or their equivalent and these are carried by the cradle proper the platform shifting transversely to the track. Now in the case of the two-care dumper there would be with raiss of horizontal shift needed to get the two ready to

### SCIENTIFIC AMERICAN

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The Edit r is glil t fire vulmitted t him timely articles suitable for it se churius especially when such articles are occompanieli / ph t graphs

### American Shin-Operating Program

III operation of a large merchant marme is complicated and difficult to a degree that is mly understood by those who are engaged in it and Mr. Hurley is to be congratulated upon the clarity with which he handled this problem in his recent address before the National Marine Lengue in this city. In a previous address on the question of our shipping be dealt with our great constructional program—what it had done and what it pripried to di. In this address for the first time. he give in outline. I his preposed plan for the ownership and operation of the vessels built for the Government by the United States Shipping Board of which he is Chairman

The outstanding feature of the address to our way if thinking was his caudid idmission that he was un alterably opposed to government ownership. In un mistakable words be ann un ed that as the result of his own experience both in private histness before the war and since he has held his high position in the councils of the Government he was our meed that only by the sale of the ships to private owners and their operation by private interests would it be possible t so are that combination of energy and institutive which are necessary in all lusiness enterprises and nowhere more so than in the matter of the operate n of a great mer hant fleet At the same time he would have the fleet operated in close execution with the Government both in respect of advice and of financial support. He aims to prevent the passing of the flut under the central of a few great companies by framing the terms of purchase and governmental operation so that watering of stock would be prevented and the field would be kept own to the small operator whose opportunity to compute with the large operator would be protected by the Government

At the present time the United States Covernment owns 555 occan going steel cargo ships aggregating 3,385 475 deal weight time. In addition it has under contract 1 336 similar vessels of 9 275 006 dead weight tons If our present program be carried out there will be under the Amerian flag next year 16 732 700 dead weight tons (11 155 000 gross tons) of ocem-going steel cargo and passenger ships. Of this total the Government will own about "O per cent or say 11712890 dead weight time (7 809 000 gross tons and the nation must at once determine what use it proposes to make if this great national asset

Many are the plans which have been considered and they range between straight government ownership and uperation on the encelled and upregulated private ownership and peration in the other. In then order as given by Mr. Harl's they are first government ownership and opinion soud g vernment own relip and printin frite brackt fith Covernment through the medium fapriva apartir a third government awnership and crivate a rate of re-vernment account fourth government own rship on liprovite op ration for private account 1fth own 1 1 by 1 single private corporation and listly privit wincrship and operation in which the vessels would listly privite companies to be operated by them entirely for their own account the Government thus relinquishing all interest and control

Mr Hurley's recommendations are that the ships shuld be sold to and operated by American ortizens under no restrictions other than the terms of the bill of sak and the fixation of maximum freight rates and he considers the ships should be a ld at a price which fauly reflects the current world market for smaller

Inder this arrangement 2 pri it of the purchase price feach ship would be pri level at the date of purchase the remainder falling line and payable in graded annual metalments extending over a period not exceeding ten years. The Government would take a mortgage for the unpaid balance harging the customary commercial rate of interest of the per cent. One-fifth if this interest representing the billerence between the enstonary government interest if ar per cent and the ustomary commercial rate wo libs paid ato a Merchant Marine Development I in I

The purchaser would be required to agree to insure and keep insured with an Ameri in marine insurance company has equity in the visil and because the American marine insurance market has not at present sufficient resources to underwrit. Il the vessels which the Covernment has to sell to Covernment should arry in its own fund as at present but for the purchaser's account insurance in the bull and machinery covering that part of the vessel in which payment has not been made

No vessel could be transferred to foreign registry without express permission of the Covernment and each purchaser who wished to operate in the foreign trade would be obliged to incorporate under haderal charter One member of the Board of Dire 1 is for each company will be usued by the Government he will receive no salary but only the customary directors for for each meeting be attends. Thus government named directors would meet periodually in Wash agton where they would confer with and advise the Shipping Board

the Merchant Marine Devil pment Fund representing me hith of the interest n the mortgages would start with \$7 650 750 the first y ir and the size of the fund for the 10-year period in whi b the ships would be fully paid for would be \$83.513 | 0 | 1 his fund would be used to relieve such financial lift ultus as may be encountered in the development t in adequate and wellbalanced American merchant murine Thus realized that a number of trade routes important to the immediate or future welfare f American commerce. must be established and developed. Some of these routes may not yield operating profits until their existence shall have attracted an increased volume or better balance of trade Thus, in cases where the Government sells a ship upon condition that it be operated in a route which may not prove profitable at once at will be necessary to provide for the payment of defaulted interest from this Merchant Marine Development Fund

Mr Hurley in conclusion stated that his plan was hased upon profound convictions formed after close personal studies of conditions at home and in Furope and after careful consideration of the best information he could obtain of what is going on in other quarters of the globe. At the present writing we are inclined to agree with Mr Hurley that among the many proposals which have been made this plan as thus briefly ske ched presents the best promise of meeting the situation. The whole address which is worthy of careful reading is published in the current issue of the Suprimment

### Our Special Correspondent in Europe

ITH the publication in the present issue of Mr Claudy s article on British Munitions' we bring to a close the series on reconstruction in Lurope, so far as it cincerus Great Britain From London our correspondent went to Paris and the stary of reconstruction in France commences in the acxt issue and will run through acveral numbers

The problem of swinging the whole energies of a great nation around from the activities of war to those of p 1 ( is scrious in any war and in a struggle of the magnitude of this war it is simply stupendons. In the east of strucken France, whose inclands were for many years the principal arens of the conflict the task of reoustruction is not only stupendous in magnitude but uttorly bewildering in the complexity and infinite variety of the contending claims, each of which calls for quick relief In Lugland where, save for the occasional and limited destruction wrought by the Zeppelin and the sirplane, the material damage was relatively negligible, the resc struction problem, as Mr Claudy shows, is saturely sconomic points al and social—it is a mechanical problem. of placing was plants on a peace hasts of the construction of delayed buildings of restoring run-down railways of rebuilding shuttered industries and above all, of readjusting labor conditions

The I reach Government must also do these things but overshad wing them all there stares it in the face vast stratches of the fairest lands of I rance once teeming with inhabitants and a hive of manufacturing industries. which he today as barren desolate and devoid of inhabitants as the desert of Sahara | The magnitude of the problem which confronts the I renell and the methodical way in which they are applying their intelligence and ourage to its solution, will be told by our correspondent in the series of articles which will commence in our following issue This material was gathered from official sources in Paris and after an exhaustive personal exploration of the stretch of wasted land lying between the North Sea and the city of Verdun

### British and German Gunnery

ONSIDERABLE discussion has been going on in the British press of the respective gunnery resultin the British and German navies particularly at the Battle of Jutland Critics of the British methods clause that the sinking of three of Beatty's battle-cruisers in rapid succession proves that the German fire was more efficient An explanation of this superiority is found in the supposition that the German salvos were "bunched," whereas the British were relatively scattered, that is to say the British aimed to get in one hit in every salvo whereas the Germans expected that some salvos would miss but that several bits would be made in each salvo that did land

In explanation of the above it should be stated that no two guns of the same type or mark, shoot exact alike This is due to slight but apparently unavoidable differences which serve to scatter the shots from a broadside say of a doren 12-inch guns. Some of the shots will drup over others short of the target, and the extreme difference may be as much as 1 000 yards at great ranges. To correct this, the guns are calibrated' ertain corrections are made and the sights adjusted After a broadside of guns has been calibrated all the shots should theoretically fall on the same spot, though differences in the respective charges of powder may ause some dispersion in spite of calibration

However let us suppose the calibration has been well done and that the powder is very uniform In this case, if the range-finding is correct and the gun-pointer expert several shots of a salvo will land on the ship. Good But if ranging is difficult and the gun-pointer is not quite up to form the target will be missed altogether and not a shot will go home. Now it is these considerations that have made gunnery officers prefer to have some dispersion in their salvoes for if the shots are spread out over several hundred vards the mean point of impact does not have to be exactly on the ship in other words, although aim may be a little long or short, one or more shots will have a good chance to land

The British favor-or, at least, they used to favorhaving a certain amount of dispersion in their broadsides

Sir Percy Scott, the father of modern gunnery and particularly of director-firing once told the writer that when he took over a certain new dreadnought, he did not calibrate the guns closely, believing that he could obtain better target results in this way

In the earlier stages of every engagement the German gunnery was good but as soon as the British got "on," there was a rapid falling off in accuracy This may be explained by the possibilty that the German system of director-firing involved elaborate electrical connections, the breaking of which by landing shells disorganised the whole system Or was it that German nerves were shaken by the burst of 13 5 and 15-inch shells?

We are inclined to the belief that the comparative immunity of the German battle-cruisers of which only one was sunk, was due more to superior protection than to better gunnery. The High Seas Fleet was built for service in the North Sea the Grand Fleet for possible service in far distant waters Coal capacity and berthing space were sacrificed in the German ships for elaborate subdivision of the hull, heavy side armor and complete armored decks.

### Engineering

A New Hatbor on the Baltic. It is reported from Copenhagen that is new harbor is to be constructed at Konte, which is a Danish seaport 00 miles west-aouth-west of Copenhagon. The cost of this work is estimated at \$0,000,000 kronts and it is stated that American capital has been interested. The harbor will have a depth of ten meters as against min uniters in Copenhagon and large quays will be built with ample facilities for handling merchandes.

Comment Joints for Water Mains I he Burcau of Water Works of Portland, Ore has been using cement in place of lead for the joints of its cast iron water mains According to the congener of the Bureau one jound of commant at half a contribution of the state proposed of the state of the position of the state proposed to that there is a material saving in cost I for labor of making the joints, however reduces this saving because the comment joints have to be kept wet for from 8 to 48 hours. The joint is first parked with yarn and oakun and then neat comments forced and the neat comments of the state of the property of the state of the stat

Speading up the Hardening of Concrete—Inburseu of Standards recommends the use of a small quantity of calcium obloride in the mixing water of concrete in order to accelerate the hardening of the concrete. Tests conducted by the Bureau show that the addition of calcium chloride up to 10 per cent by waight to the mixing water increases the strength from 30 to 100 per cent over that of concrete in which plans water is used and that the best results are obtained when from 4 to 6 per cent of calcium chloride is used. While calcium chloride has in additional so and the concrete it does aftert iron and steel and therefore the saft should not be used for removed control to the saft should not be used for removed control to the saft should not be used for removed concrete the saft should not be used for removed concrete.

How Much Water Should Be Used in Concrete?—
The Emergency bleet Corporation in connection with
site work on concrete vessels has developed an apparatus
for testing the amount of water which should be used in
concrete work. An open metal cylinder is employed,
resting upon a glass plate. This arrves as mold which
is filled with concrete and amouthed off level on top.
Then the cylinder is reased leaving the concrete on the
glass plate. If the muture is very dry the concrete
will maintain its cylindrical form but the wester the
concrete the more it flows out at the bottom so that is
measure of the consistency of the muture can be obtained
by measuring the hoight of the cylinder or cone of concrete after the metal evidined has been withdrawn.

I Treating Rallway Ties with Zinc Chloride—The American Rallway Engineering Association while admitting that presents in generally the best preservative for railroad ties calls attention to the fact that there are cortain conditions in which it cannot be used consume ally, and under such conditions recommends the use of ance obloride instead. One of the objections to raise chloride is that where there is excessive rainfall there is a not usually very as rous and it can be checked to some extent by the use of a liberating securit. In this should be seasoned for 60 days after treatment we as the increase their strength and so at to reduce the amount of leaching of the microfildrate. This also reduces the lookage of surrous from the rails.

Novel Bridge Engineering -Not long ago it was discovered that the piers of the combined highway and railroad bridge across the Missouri River at St. foseph Mo, were in bad condition and it would be necessary to build new piers At first it was proposed to build the new piers on the downstream side of the old bridge and shift the bridge laterally to the new position, in this way maintaining traffic over the old bridge while the new construction was going on But the War Department required the installation of a larger draw-span in the bridge and so it was decided to build the new piers between the old piers After they were completed, the fixed spans of the bridge were moved shoreward and wise, so that they rested on the new piers A temporary pan was constructed to fill the gap thus occasioned so that traffic was closed over the bridge for less than ten hours Then work was begun upon the new swing span which was built as a cantilever in open position permit of this, a portion of the old swing-span had to be out away and a temporary lift-span was put in to take care of river traffic. Thus the bridge was reconstructed without changing its almement and with a minimum interruption of traffic

### beigne

Tide and Current Observations at Lightships.— The Const and Geodette Survey has recently obtained authority from Congress to pay at t. exceed \$1 a day active extra compression to comply store of the Bure und Lightshouses for noshing observative. It false and currents Many high-bards per particularly with substituted for noshing which observations and at us exp.  $\pm 1$  fb a valual le data will be collected.

Indexing Family Traits of Americans 1 he Fugence Record Office at C 11 Spring, Humber 1 ong Island is engaged in building a mandstrial index of the inhorit traits of America families especially with a view to studying the inherit in a 1 sub-traits training their recombination in given a discrete to Down to the beginning of last year the Offic had on the 54 825 cards indixing individuals will a described in the archives of the establishment in the bases of surraine natural trait and geographical in hits. An elaborate classification of traits has been wiseled in

Measuring the Temperature of Lexes. Missisted Boltzele has divided very mental teletrical apparatus for measuring the surf. traperature of leaves and his been making no source not as in the desert and mountains near Towson Size, and the Santa Turn Mountains in California. Size is press that the most notational California. Size is present that the most notational california Size is not required to the surface temperature of a lad growing in the open may fluctuate. Chairs of fe mis out to three degrees. Can subserved within from 20 is 10 seconds. If a modified yet growing wind to be suig the change my amount to five degrees in 0 seconds. Chairs of the degree in the surface temperature of a ladight of the degree in 0 seconds. Chairs of the degree in the subserved with the doubt the cause of their fluctuations.

Radium Production in the United States. Mr. C. If Voll sering in Seense states that the total production of radium element in the Luited States down to 1919 is about 5 grains which is probably more than half the total radium produced in the world. During the world stadium supply has been per line In the Roceanty In 1918 the United States produced in 1918 from the country In 1918 the United States produced 14 grains. When regard to a discussion that his scurred constrainty the amount of radium that can be pr. In cl from the carnotic fields Mr. Voll any a that the cern title fullings of the Standard Chemical Company. While compress about 390 dains and are the largest be dings under the control of a single concern are estimated in the capable of viciling a least 500 grains of radium.

Zoological Station in British Guiana | lbc work of the British Guiana Research Station of the New York Zoological Society which was interrupted by the war has just been resumed, three members of the staff headed by Director William Beebe having suited for South America on February 26th Plus is the station which Theodore Roosevelt visited three years ago and The establishment of a tropical of which he wrote research station in British Canana by the New York Zoological Society marks the beginning of a wholly new type of biological work, capable f literally illimitable expansion The station is situated at Katabo at the very edge of the jungle and at the junction of two great rivers-the Mazarum and the (myum It is now being equipped with the most complete laboratory equipment ever taken to the tropics A number of enquent Am ean zoologists will undertake investigations at the station in the course of the present year

The Dendrograph -Dr D I Mac Dougal apply a this name to a new instrument devised by the Depai ment of Botanical Research of the Carnege Institute : for recording growth and other variations in the din 1 sions of trees. I we types of the apparatus are now in use. Both employ a belt of weeden blocks hiezed together and fastened securely as a supporting belt around the trunk of a tree. In one type series of plungers in contact with a number of selected points around the tree carry on their outer ends an encircling wire Any change in position of the plunger moves the enourching wire and the motion is recorded by a pen on a suitable revolving drum. The second type carries a voke which encurcles the trunk of the tree with four points of contact Changes in volume of the trunk are followed by differences in distinces between the contacts, which are duly recorded as allove furnish an interesting record of the daily and seasonal changes in the size and form of tree trunks

### Industrial Efficiency

Alcohol from Swedish White Mosa — A syndrest has petiti not dit Swedish givern in for primission it make 6 000 000 000 liters (1/21 000 gallong) of alcoholo gaint from white moss of white liters are commons againt from white moss of white liters are commons and to be very got in diff. On sold long criticity than againt on odd from grain or jitt is. It rais be easily denatured the primission of the literal properties of the literal

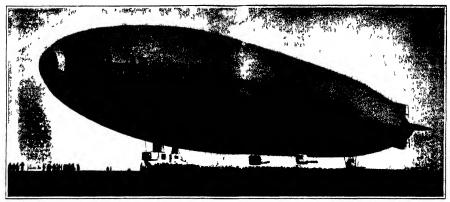
Care with Scaffolds—During the most year their have been reported to the Burt are number of accidents which have occurred as a result of seaffolds breaking collapsing. I falling While those accidents are not frequent according to Sigle Bulletin they are as a rule of a 8 min mature. Construction of 8 sail idea of either mountained of the seaffolds of cutter that of the seaffolds of cutter that of the seaffolds are constructed as that they will and by stand the band kinch they are expected to bear. Nothing but the very best of meteral 8 should be completed.

Fuel waving I he raigh the cooperation of the fundational production by an explaints which have thus far put into force the standard re-ommendations of the United States and I and Administration is by an office feature in the defensive in the defensive in the use of fuel in power plants in saving of 7,000,000 toos similarly from the annumerous of the national program of \$500,000 toos have been conserved at the same time in annutation growth and the production in the factories of the production of the national program in the following states where the production is the factories of the production of the factories of the production of t

Deep-Sea Salvage Equipment -Owing to the dangerous nature of the coast and the consequent frequent wricks salvage work has always been of consideralle importance in Spain. This work has been increased by the war during which many vessels were sunk off the Spanish coast by the Uboats | The large profits from the business which before the war was largely in German hands have attracted the attention of cantalists in northern Youn and an important company has been organized to engage in salvage work flus company is well equipped but owing to the great extension of its activities new purchases are constantly being made. There is therefore an unportant market in Su un particularly in Corners, for the sale of the latest devices pertaining to this work, and also for machinery for the reduction of the salvaged metals

Use of Goggles A large number of accidents have been reported recently due to the workmen not wearing the goggles provided by most companies for employees engaged in certain classes of work. It is rather difficult to understand the attitude of many workmen toward goggles in view of the painful injuries that so often follow full me to wear them. There is no excuse for men not wraring goggles in such work as for instance disconnecting steam or acid lines. In a recent case, however two workmen taking down an acid his sustained psinful eve minries due to the acid solushing. It is for the foremen in charge of the work to take greater pains in explaining the use of, and the results of a failure to wear goggles while engaged in certain classes of work continues Safety Neus Goggles are provided for use and it should be impressed on the minds of workmen that they are to prevent unnecessary and painful needents

Sultable Tasks for Disabled Fighters -An outline of the efforts of the Bureau of Limpleyment of the Pennsylvania Department of Labor and Industry to and suitable industrial tasks to Pennsylvinia for disabled soldiers and sailors is given in a buildin just issued by the Department | Has bulletin which may be obtained upon application to the Department of Inbor and Industry at Harnsburg analyzes by task and locality the 50 000 copicyment opportunities offered by 900 emulovers in 60 counties number of plants kinds of firms and numbers of openings in each class of employment. One series of tables shows at what tasks several hundreds of disabled men are now employed by the Philadelphia and Reading Railway Company Another chapter on Placement of Disabled Soldiers and Sailors in I mplovment gives a general review of the placement subject outlining conditions that may be expected and methods to be employed in locating each disabled soldier and sailor at a specified task in Pennsylvania plants



and the strigid dirigible constructed by Great Britain the R-32—which made its first flight on March 6th last staying aloft some three hours

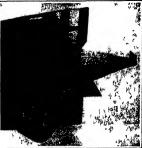
## Is the Dirigible Outstripping the Airplane?

### Recent Progress in Lighter-Than-Air Craft Which Has Brought That Type to the Forefront of Aviation

THIRT are all the elements of a good romance in the story of the dirigible. As the first type of airship to be taken up by the nations of the world the lighter than air craft proved quite unsatisfa tors. The numerous mishaps to the early dirigibles impressed on the minds of the general public an absolute contempt for that type They did not stop to consil r the crude nature of the dirigible—they did not recall that the steam locomotive back in 1830, was just as crude—just as inclinent— They simply condemned the dirigible on first impression

simply concerning the diriginal of next impression. Then came the airplane—there is something fascinating about the airplane with its delicate structure of fine ribs and fabric and the powerful driving engine and propeller and the publi immediately became attracted. to the heavier than air crift. Numerous intrepid air-nich did all sorts of daring stunts with sirplanes. Crude as they were in the early days much it the satisfaction and interest of the lasty. An it the eping days of the war found the arriplance evening practically all the attention from military suthereties to the more or less complete sex haston of the dargold—except in evening the complete sex haston of the dargold—except in even many.

The layman never could understand how old Count von Zeppelin could continue year after year to build his ungainly dirigibles. Indeed, it seemed that as fast as he turned them out they met with trage accidents and an untimely end. Yet the Count continued, and when his money gave out because of the long series of failures of



Tall members of dirigible, with lookout post

his earlier Zeppelins the German government came to his rescue and supplied practically unlimited funds. And again the Count wont on building more Zeppelins than ever and the more he built the more, so it seemed, were

destroyed. When the war came on Germany attempted to employ her wast fleet of Zeppelus—which she had accumulated faster than they could be destroyed under ordinary navigating conditions—with unsuccessful results. Truly, she manufaged the military value of these bugs drigbles, but when she turned them over to the navid authorities, they unmerdadely proved a bug success. As super-vector, where the construction of the propelus, which could be completed with the Zeppelus, which we complete with the Zeppelus, which we complete with the Zeppelus with the Zeppelus, which we complete with the Zeppelus with coming down for fuel or supplies

coming down for fuel or supplies
Great Britain, quick to grapp any new idea in naval
warfare, soon appreciated the advantages of huge rigal
dingibles. After constructing wast feets of small nonrigid and semi-rigid dingibles for anti-U-boat warfare,
sit turned to the construction of rigid afringles with turned to the construction of rigid afringles with right point of detail and performance may prove more than a match for anything
cermany has ever constructed notwithstanding the
world-wide belief that Germany is the only country in the
world-wide belief that Germany is the only country in the world capable of constructing huge dirigibles
That, in brief, is the romance of the dirigible



Forward gondois of the R-33, which contains the navigating quarters and a single 250-horse-power engine



Eryman New Os.

One of the two "power oggs" located amidukine, containing a single
210-horse-power stigles

son out despite all obstanles and against the greatest handscap of all—public opinion its war record, aside from its een splendid In four and a half years it has shown a greater proportionate develop-ment than the airplane, unbelievable as this may sound And now that commercial aviation is being discussed in a really businesslike tone, the dirigible looms up as the real acrial greyhound of tomorrow with the airplane as little more than a "feeder for the dirigible. That is to say, dirigibles will cover the long routes of arriguous will cover the long routes of thousands of miles, where quick trans-portation really saves much time, while the arplane will save to bring passengers and carry them away from the drigble stations located a thousand or more iniles

Typical of the immediate possibilities of the dirigible is the latest British rigid airship, the R-33, shown in the accompanying illustrations This dirigible, which made its trial flight on March 6th last which it remained aloft some three hours and reached an altitude of 2 000 feet is 670 feet long and 79 feet in diameter at the thickest point along its splendidly stream-ined body. In fact, the R-33 closely follows the lines of the German Schutte-Lanz dirigibles, which are stream-lined instead of pencil-shaped as were the earlier

The nose is round and somewhat tapered while the stern is tapered to a fine point and carries the openage, or tail members An interesting feature of the tail is the small lookout post which is shown in one of

the accompanying illustratary application of the dirigi-ble is used as a gunner s post The body of the R-33 is constructed of duralumin girders, covered with fabric and con-

tains 19 gas bags Suspended from the huge body of this British dirigible are four gondolas i he navi-gating quarters are located in the first gondola which is placed well forward. Some what farther back or abo amidships, are two so-called touring gondolas or power eggs Finally, there is the large gondola aft i file forward and amidship gon-dolas are each provided with 250-horse-power sunbeam Maori angine while the aft gondola carries two similar agines coupled together and driving one large air screw The R-3d carries a crew of

23 men, and is said to have a cruising range of 4 000 miles at 60 miles an hour It weighs 60 tons, and sarries a useful load of 30 tons In

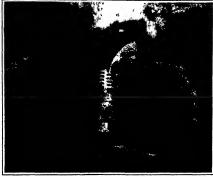
nearer 20 mins an nour and it may be that int eightes will have to be replaced by more powerful units in order to secure the requisite speed. At any rate, this dirigible appears to be a most commendable piece of work. All conveninces have been provided for the crew, including facilities for cooking and heating food, by means of hot water from the engines and electric stoves Parachutes are provided for use in the event of accident The R-33 is one of several

the prelimnary tests thi spird so it is reported has been

er 50 miles an hour and it may be that the engines

dirigibles of similar type which the British

are rapidly completing Compared with the airplane, which only es the advantages of high speed low east of production and maintenance, and long endurance, the ability to carry heavy loads, which is a corollary of long en-durance, variation of speed and the ability to "float" or remain sloft while enginee or other mechanisms are being inspe other mechanisms are being item-repaired, general reliability, by which is meant maximum freedom from liability to mechanical breakdown during flight, comdescend in unfavorable country even if the engines totally fall



oright Register Visit (A. Compression of the Resident Compression gas cylinders connecting tubes and valves employed in inflating the 19 gas bags of the R-33

Recent improvements have raised the rigid dirigible to a high plane. The adstitution of helium for hydrogen which is out of America's contributions to

military aviation removes or f the greatest prejudices

The R-33, Great Britain s largest dirigible coming out of the huge shed preparatory to the trial flight

against the lighter-than-air r ft. I or i w that behum

gas which is non-inflammable it used in place of ex-plosive hydrogen, there is no facther me doto think of conflagration during flight or on the ground. Figures



A plunge through the sand-bag barricade at "Death Curre" during the recent 280-mile road race at Santa Monica, California

can be placed anywhere, and so can the galley and st vis and heating plant since the designle is a clonger a buge explosive charge held in a silk long ready to burst in te flames at the slightest spark

367

then there is the nature of busing and mooring. The Bitteh have work dout as I me time entry trigill's for single most prayed dout. must privil dwdl i - i dving top the lingible at turn maccordance with the wind and is not 1) ted to any sen us strains. Indeed. British directly him been moored in the armore for five weeks at a time, successfully withstanding winds up to 52 miles an h ur with only two or three men to wit hafter it

I rantly the surplime us a commencial proposition is today but a poor second to the dirigil le except in its own limited field which is the carrying of a small number of passengers over a short distance of say a few hundred miles or the transportation a light cargo such as films or a ugor eergo such as films most scarrities jewelry or other items of a high intrinsic videc in instance where great speed is the very quintessemi of the journey or reuti. The airplane is to be the journiyor reuti. The sirplane is to be the empetitor of the fast rule oil train, while the dangeble is lestined to be the currier of passengers and goods over long routes an competition with the transcontmental trains and the intercontinental steamers

### A New Substitute for Tool Steel

ONI of the war time devel pinents in 1 ugland due to the reute shortage of thingsten was the manufacture of an all v steel containing no tungst in the take

the place of tangeten high speed to letted. This stiel high it brome and cobalt is n w bring used for the manda but of dissind to is birg iffer 1 is a substi-tute bith for carbon and turgstin high spied (2) The steel is made no i is 11 re in pig form. He pig it tal is milted at the Clevel of plant in a crucible at 1 1st in nollism the form desired. He pattern makers male the same allow and a for shrinkage as they do for soft steel The cost tools are furnished in winneshed form to the customer, who ma necesions and after harden

The allow is being east into blanking, drawing and forming disk but and cold trimmers for forge worl indling entiers countrismks slotting saws and bending rolls. It is also stated that cast tools nade from this

all y are being successfully used as cutting tools on lathes planers and shapers where working on brass and bronze. The metal produces it is claimed a chean casting free from blow holes and other imperfections

### An Odd Automobile Accident

URING the right 250-nak road race at Santa Monica Call one of the cars met with an a cident at a sharp curve known as Death Curve Hen a sund bag barricade hel been erected ostensibly for the purpose of keeping the ears within the bounds of the red. The ear in ques-tion was going so fast that it could not take the curve but strick the barricade and leaped over the sand bags. Fortunitely neither the driver Roscoe Scarles, nor his mechanic was injured. More remarkable than the accident however was the fact that a photographer succeeded in snapping a picture of the car as it was in mid-an had taken a position at this point expecting to obtain some thrilling pictur's and was fortunate enough to make in exposure just as the accident occurril. The picture he took is reproduced herewith Note the cloud of sand thrown up from the sand bags and also note the t legroup pole which the car grazed as it plunged

### A New British Port

# Proposed Dock in Falmouth Harbor That Could Accommodate 1,000-Foot Liners By Eric A Dane

R ICLNI develope its indicate that the next few years will see it. Into thing of many large steam ships with it may range up to 1000 fector more in length. It that event own births and graving docks need to provide it that the control of the most suitable ports.

If exist in the most suitable poins. A recording to Syr A Bonds of the Cunard Company the purely cargo estamil in the North-American Takes possing. In Express I had fulfill the American Takes Presson, I have present the Conference of the Conferen

Britanic 50 000 tons 50 000 tons 885 fect Olympic 45 000 tons 882 fect, Mauretania, 32,000 tons,

780 foet. The principal ports of bigland, the majority of bigland, the majority of which are approached by long and shallow chaintle, were more or in secondariant for shipping in the past, but the heavy espenditure accessary to adapt them to the requirement of continued to unconvenient of the continued in the continued of the continued in the c

The Right Has I ord Price of Fighand and recently that his country is just begin may to build the type of large stranships which will carry the trade of the great onto must like America and Australia but that it is only by enoughing the construction of deep water ports and great graving do ke that slip build

ing can progress

From this it is obvious that
England must find new ports
to accommodate the lig ships
at all hours of the day re
gardless of weather and tides
it is quite certain that after

the war the passenger and shipping traffic will be resumed on a scale larger than ever be for and we can look for the 1000-loot liner in the near future. The compution of the British and the continental stranships for the great shipping traffic of Northern Europe must center in the shipping traffic of Northern Europe must center in the borths and docker must be constructed. Set William White to be the and of the set of the se

as reported to have had onch stress on the fast that it is not so much a question of lag shapes so f praviding docks and ports large (100 gl) to accommodate these and ports large (100 gl) to accommodate these of shape part described has he in implanced in statements made by the White Ster managers. The have said that of they were compiled to despite the stemshape like the Olympic from Southington (who day on no fewer than eighty orasines of its year they could not said out time. It is discovered to be a subject to the state of the said of the state of the said of

restricted under naval orders. Shipping authorities in I ingland have agreed that St. Just in I almouth Harbor would make the most ideal deep water port. It is matted on the eastern shore of the harbor, which is the nearest deep-water barbor to the

entrance of the English Channel from the Atlantic. St Just is easily accressible and hand to ket, and vessels of any drught or size can safely ents: and keep the many state of the title. There is no bas sitting or securing and title strength of title. The harbor wifters a direct and safe approach from the ocean and whiter. Owing to natural advantages the secommodition required for the properties of the second could be environt at the three that the properties of the second could be environt at the title advantages of the site are equally (avorable for the construction of the necessary adjutcts of a harbor and docks of the first class.

overs or the next case.

Shapping and government intensits of Lanjand have Shapping and government intensity of Lanjand have powers conferred by the St. Just in Roseland Experimental Dock-Works Act, borngs survey and other experimental work have been carried out. This work has proved the practicability of the proposals and also furnished the syndicate with important data which will comble the construction of the docks to be effected at a minimum of rask and consaderable saving of expense The Admirally has given its consent to the proposals country laver passed rable and other public bodies in the country laver passed rable and other public bodies in the support of the chans-also modularly.

the tollowing can enter or leave in all Anumer's country have passed my country have passed resolutions in its favor, and it has so that the support of the chura-day industry for coan passengers and my control of my order order of my order 
How the new port in Falmouth Harbor stands with reference to the present ocean routes

The deepest portion of the area proposed to be utilized varies from 90 to 75 feet at 16 so water orthinary agring tides and the site is no well profit (of that viciollo of the deepest draught can, at all times safely enter and leave the docks writin which they would be made from the value of the six. The deep vater runs close to the short and bank, whore landing pears up to 3 000 feet in leight and also various query and jetties could be thought constructed, with a depth of water alongade of the analysis of the particular program to the construction of the property of the large ocean lines and other vess to. The please would also offer economical

the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property o

It is proposed that the docks shall provide the most convenient and cheapest accommodation in the Channel for passengers must and freight curied by the lines, and for the important chins-clay, coal and other traffic. It might be mentioned in this connection that since the outbreak of the war. Falmouth Harbor has been used extanevely by steamblips of Allied and neutral nations. By mixing the proposed docks their port-ocall the American, Canadian and other ocean liners would effect a considerable saving in time as compared with calls at Southampton, Plymouth, Queenstown, etc. In case of the larger number of lower vessels the greater disparity between the sea and land transport speeds would considerably increase for early states of the present disparity between the sea and land transport speeds would considerably increase the advantage to be gained by calling at 81 Just. By sailing from New York to London via 81 Just. By sailing from New York to London via 81 Just. By sailing from New York to London via 81 Just passengers would reach their destination as hours and fifteen munites earlier than via and thrity minutes over travel via Southampton. From Halliat to London via 81 Just there would be a saving of such towards of the property 
St Just would provide the safest and quickest routs for ocean passengers and mails to and from London and the Continent, avoiding all

the Continent, avording all the delays, fors and traffic of the English Channel Special fast bost-trains could be brought alongside the lines quickly trained read of the course of the

Docks erected at 81 Just would be in the most favor-able position for the economical and expeditious distribution and collection of goods carried by the inners These goods tould be conveyed at system of soasting attament to and from St Just and London, Hull, Newcastla, Bristol, Liverpool, Manchester, Glasgow, Dublin, Belfast and other places which are near to great on the continuation of the continuatio

ocean and coasting trades over all the coast of the coast

favor of this cooperation of the linest and constain reseals working from a convenient enter. Praight can be carried by water to and from 81 Just to London, laverpool, etc. more cheaply than it is now carried the short distance by rail from Southampton to London. The war has abundantly domonastrated that the life of the Empire depends upon its sea communications. Whatever the existing magnitude of the cosmolories and other countries. United Kingstom, the Dominous and other countries will be considered the contribution of the development in the future, the produces the rail of the development in the future, the produces the principal contribution of the countries of the contribution of the countries of the security of the countries of the countries of the countries of the centries of the countries of the countries of the countries of the centries of the countries of the countries of the countries of the centries of the countries of the countri

### Correspondence

The editors are not responsible for statements made is the correspondence column Anonymous commusications cannot be considered, but the names of correspondents will be withheld when so desired

### The Coal Supply

To the Editor of the SCIENTIFIC AMERICAN

I have read with great interest an article in the February 22d issue of the SCIENTIFIC AMERICAN under the February 22d issue of the SCIENTIFIC AMERICAN under the title "The World's Coal Supply The subject is one which deserves, and is beginning to receive careful attention and intelligent discussion. The article in question sets forth with admirable clearness and force tain important aspects of the situation, but as to one certain important aspects of the situation, but as to one wital point, the probable life of our coal reserves it con ways a very misleading impression Your article exhibits a chart "How long the coal will last", which shows for the United States 4,000 years

last" which shows for the United States 4,000 years and for the world 3,400 years, with an inconspicuous note to the effect that this duration is based upon present rates of consumption. These are the figures which the casual reader will remember, his impression will obviously be that our coal reserves are practically unexhaustible and not in any sense a matter of concern (or many). and not in any sense a matter or concern on tonary generations, or even centuries to come. The possible mathematical correctness of the figures in no way inti-rates their essentially mulcading character. The chart gates their essentially mustading character. The chart in question and the text of the article goes on to state that in question and the text of the strictle goes on to state that the "commercially available supply at estimated future rate of consumption is sufficient to last 1,500 years. This estimate is fallacious beyond any possibility of explanation or qualification. While it is quite probable explanation or qualification. While it is quite that some coal will remain in the ground at the 1,500 years, it is inevitable that within a small fraction of this period our coal will be so far exhausted as no longer os vins person our ous win be so in remained as no longer to play a predominant, or over a prominent, part in industrial operations and developments.

What are the facts of the case? Let us take the United

States, where, as your article correctly shows the present rate of depletion is less than for the world as a whole It is utterly meaningless to express life of our cool reas is unvery meaningless to express me of but cot re-sources in terms of such a casual unit is production in 1913 or any other year. For a long series of years the coal consumption in the United States has been doubling approximately every ten years, an annual increase of nearly seven per cent. For the past three years it has been increasing at the rate of 95 per cent per annua. For 1018 the figures thus far published show a mile production in the Eastern District of about 480,000,000 tons and in the United States of about 680,000,000.

If the coal consumption were to continue to increase at the apparently normal rate of seven per cent per annum, and if the proportion of recovery from the mines were as high as two-thirds (considerably higher than has been obtained heretofore) the life of the known coal reserves of one eastern district would be 59 years of the combined eastern, central and southern districts 65 years, of the Latin United States and Alaska over 60 per cent of this supply bring lignites and coals below 60 per cent of this supply bring ignites and coast below the rank of hitumnous, 81 years. These figures are based upon estimates of the Geological Nurvey. They include coal in vente as shallow as 14 in-thes, all coal of up to 30 per cent ash and all known deposits within 0,000 feet of the surface. Obviously on a corresponding bass the life of the coal munable and usable under present

bass the life of the cost munble and usable under present standards would be materially less and the standards would be materially less. These figures bring out, with starting clearnoss the condition which we are facing the innescapable did mine of suncidally rapid exhaustion of our invaluable coal ra-serves or of curvatainent in the growth of our ful con-sumption. If our supply of good, ascessible fuel were manufactured to the contract of the contract of the con-traction of the contract of the contract of the con-traction would not contract to a mean of the consumntion would not continue to increase at the current rate of seven per cent per annum. The time is now upon us, however, when our coal consumption will be ned not merely by our needs but also by the increasing sorreity and expense of the supply The resultant curtailment in the growth of our fuel production will carry with it a concomitant curtailment of our indevelopment, a curtailment which at can be offset only partially by increasing efficiencies and resort to other energy sources. We are using the cream of our resources, and using it too recklessly and too freelfsetently

As your article suggests, the more important immediate conomics seem to be 1. Centralisation of supply of industrial and other

power in huge experitations embodying every practicable measure of efficiency. Industrial power plants and electrical utilities now burn nearly half the coal mined

annually I arge modern central stations have a thermal efficiency of at least four times that of reasonably good is lated industrial plants and further improvement is

2 Location of these super stations at or near the coal mines in order to supersede railroad hauling of coal by electrical transmission of energy over wires. It is estimated that for every hun had tons of coal shipped over railroads, the locometries hading the coal cars burn 10 tons. On a sufficiently large scale the total cost involved in electrical transmission from the mines would be only one-third to on hulf the freight rates on an equivalent amount of cal

3 Fullest possible devel | m nt of water powers within economic limits as to costs. It must be kept in however, that water p wer development is no ea. The available water powers tributary to our great castern and central aidu tual regions can supply only a minor part of our pew i needs at I our main energy source must continue the coal. Water powers energy source must continue to come water powers are in general very expensive unless in nake their development feasible every possible to unsagement in the way of favorable legislation must be afforded as well as comprehensive organisation of power requirements in order to utilise efficiently the scason dly varying water power output

Flectrification of steam rulroads Steam railroads at present consume more than 2 per cent of our cost output. By electrification this would be reduced to

seven per cent or eight per cent

5 Licetrification of coal mining perations particu larly in case of anthracite in: s where a mine usage of 10 per cent of the output could be reduced to 112 per cent by electrifications, representing an effective saving at the present rate of product n of nearly 10 000 000 tons annually

6 Improvement in our \travag intly methods of coal mining Of leposits worked to date been irreparably wasted

The unprovements in practic outlined leaving out The inprovements in panetic outlined leaving out of consideration the use of water power would make available from our present out production more than twice the present useful production more than twice the present useful production from the twice the present useful production that the most of this may actually be realized in the num but future.

The problem of coal supply is fundimental and vital to the future industrial, e admin and general social development of our country. In lustrial civilization development of our country. In instrint contacting depends upon two factors pacer and raw materials but whereas raw materials are will, distributed power sources are not. The nation or people's holding the world's power sources, of which is call is the principal one, control the bases of the wirl is industrial develop. ment Our advanced envilsation out high standards of living depend upon use of power. They could not be supported by what men could be with their physical neth Human labor require power to multiply its cuess. The present high standard of living productiveness. The present high standard of living in the United States is due primarily to our exception in the United States is due primarily to our exception ally high per capits use of p wer. The United States has nearly half of the better grid and more necessible coal deposits of the world it has over half of the total known deposits of coal of all grades. North America has over two-thirds. This m is that to this continuat potential industrial developm at I he extent to which this bounds to be a second to which beneficient bequest, or trust is realized must de pend upon the coonomy and untelligence with which it is administered

### The 50-foot Shin and the 44-foot Canal

R J McCLELLAND

To the Editor of the SCIENTIFIC AMERICAN

I note with much interest v ir issue of 1 chruary 22d I note with muta interest yer issue of LOUMEY 2241 which has on the front cover a good put ture of the 1'w section of the steamer 'Chao R Van Hose on its left on the first lock of the Welliand C unit and on page 17 a short article with reference it this visual and on page 17 a short article with reference it this visual by the United Mi. 3. ments carried out on this yeasel by the United Str. a Shipping Board were of a most anusual nature a a I behere will be of considerable interest to your readers. I am therefore, writing you in the matter thinking that you may care to correct and perhaps amplify somewhat the article in question

The primary purpose of mixing the experiments was to develop a method, which would mixe possible the building on the Great Lakes of large vessels of 10 000 building on the Great Lakes of large vissels of 10000 tons or more. The ship building plants of the Great Lakes have made an envisible record in the construction of cargo slips but because of the small ares of locks between the lakes and the oven they have been able to send out only small ships although they regularly built for work on the lakes some of the largest expresseds. The development of the convey system and

the expansion of our overseas operations developed a constantly increasing denoted for ships of the larger sizes. The Great Lakes with their well organized ship hulding plants located close to our supply of steel could have been of the greatest value if only the limitation of the locks could be av re me

Van Hise experiments devel ped a procedure by which this limit it is cluid be over inc. That this was accompleted in the stress of wir in a period of a relatively few in orther sense is served in a period or relatively few in orther is not service. The Shipping Board deserves much a life for a vering with the work. Mr. Hurles, Mr. Shiyali a life Parajound in authorizing it. It was served at by the Clevel and offic of the United States Shipping, Bord. It is true that I first suggested the plan but ill the congress connected with the Shipping Boarts Clev land office took part in developing it—Mr. H. N. Herraman of Cleveland partin developing it. Mr. H. N. Herram in of Cleveland in particular deserves credit for the success of details of the work and Mr. W. t. 1. wers for the club rate cal. culations which fixed the least one and size of the weights employed to keep the ship stable.
The Van Hise is 50 feet wide and we find that by

this meth d we could certainly take out a ship 5214 feet The widest ship previously taken out is 44 feet the wider supplier rousely taken out a value beam. For the Levinar this in teas may not seem very inpurt int. Int the Van Hiss will carry over 9 000 tans and the largest slip herefore taken out carried only 5 500 t. ns. By building slips for the purpose we are surshed that this method will double the size of slips that in my be passed through the locks.

Practically all cargo ships are wider than they are Prattally an cuse to turn one on he sade and make de y Our problem was to turn one on he sade and make liter stable in that position. Let accomplish this we placed temperary part on tanks made of steel on one sade of her deck. These were so designed that when sake was turned on her sade she would just fit in the locks was tarned on her sad, she would just fit in the locks blue we turn do in hr sad, by samply pumping water into those tanks. She was turned buck by I ting the water run out of them. The tanks were carefully proportioned so that in all positions as she turned she would be stable, that is have a positive mitaentric highly The balance was a delicate one. I apprimists had shown that if the wilgits were not properly identified that the design was the same of the s slup would turn completely over upon her deck

### Finger Print Classification

To the Editor of the SCHNTIFIC AMERICAN In the issue of the SCIENTIFIC AMERICAN published on Ichruary 1st 1919 appears the article linger Print Classification

In this article it states that to those persons who for any reason and a trouble-some to use the old or improved Henry System of finger print identification the writer, 1 H Robinson of Brooklyn N Y suggests the use of the Hollman Notation as adapted to all purposes and being sumple and accurate

a ling this article. I find that all of the ulnur loops will be place I under one primary number and only divided by the ridge counts in the little forger, while in the Henry System these loops are divided into 16 separate divisions making it far easier to search a record by the Henry System than by the Hollman System. Any records which have all whorls would all be filed under one primary number without any secondary classification numbers lie Henry System provided for 81 secondary classification numbers under the primary classification

12 There has been no provision made for approximat ing patterns

I have been in charge of the Identification Office of the Navy the last ten years and am positive that this Hollman System could not be used in a file where there are a million records. It has been the practice of all finger print experts in charge of large Identification Offices to subdivide the files in each and all of the primary and second ary classifications as far as possible in order to expedite the searches The Henry inger print system has been used by the Navy sinc Tinuary 1st, 1907 and has been found to be entirely satisfactory in every particular
By the Hollman System, as I interpret it from the

article all of the impressions in the U group which have

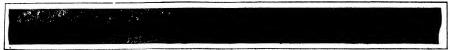
s little linger count of 15 will all be filed together regard loss of whether the loops on the index or middle fingers are mucr or outer. In the primary classification number all of these whorls will fall in the same compartment

regardless of whether the whorls in the index or middle fugers are mucr, meeting or outer
An idea advanced on this line of work must be practical

and not theoretical

Washington D C

J. H. LAVLOR



Strip of tape with recorded trans-Atlantic signals, together with the operator's decoding in poncil

### Signaling and Talking Through Space

### A Broad Introduction to the Present Status of Wireless Telegraphy and Telephony

Till recent remail the divelopment of wireless the properties and telephone is estory of cooperative invention. Prince Ancie is nitrate into the world war the various wireless interests were engaged in the usual busines impetition and only too often blocking each others way out the general progress of the radio art by patent highton. One might have a remarkable development on ar existing instrument. but someone had a base pet ut on a teature of that instrument So the man with the improvement was blocked by the basic patent—und the holder of the basic patent—in turn was powerless to improve his instrument because of the blockading patent on the improvement

### A Lesson in Cooperative Invention

Then came the war. The various wireless organiza-tions were called upon to give our fighters the very best to be had in radio instruments. Patriotism and devo tion set uside all commercial and professional rivalry and patents were memeratedly overrated where the interests of our Covernment were occupied. And what counts for more than any other single thing the inventors and engineers of the various radio organizations and the lead ing electrical and telephone companies got together and pooled then idees and exp rience for the common good

point that it is and experience for the common good As might well be expected much ram out of this co-operative work. Indeed, the wireless telephone which but a year or two ago was a delicite innertion child of the laboratory, suddenly developed into a full sized. practical means of communication available for ground use and arresult. Buffling and less in inter for ground use the aircraft that are problems in inter-ference prevention have been more or less solved. Long-distance stations have sublicity become operative under almost dl. (thosphere

conditions. The business capacity of huge stations has been increased many fold The lofty serials formerly required for long distance reception have been abandoned for underground acreals and small loops from three to six feet in diameter, erected four or five feet above the ground it goes with mains other features of wireless which only yesterday were considered the far off goal of wireless man and which today stand practically perfected as a result of unselfish cooperative effort

review of the radio att such as the author would wish to make in order to give the reader a bird seeve we was to speak of what has gone before and since our participation in the war. Volumes could be written on the development within the past year. However it is necessary to assume that the reader is more or less familiar with the broad principles of radio comminication, and has followed the various earlier developments of the art

### Ways New and Old of Generating Radio Waves

Turning first to transmitters we find spark transmitters still employed to a large extent, although many new forms of transuntters have made their appearance now forms of transmitters have most their appearance. On of those is the arc generator which, if not absolutely form of the section of the se odulator of circuits has made it possible to impress telephone conversations on the most powerful are transmitter, thereby making the latter more than ever avail-able for practical wireless telephony

For years wireless engineers have appreciated the con-venience and practiculty of the high frequency siterisator as a means of transmitting. Il were there is a vast difference electrically and mechanically between the generating of currents of 60 or 133 cycles as in commercial power circuits, and the 20 000 cycles required for radio transmission. Still, these cl. tried and mechanical obstacles have been slowly overcome both here and Among others, there has been the Goldschmidt alternator which makes use of cross ingenious winding a home for multiplying the frequency within the machine until radio frequencies are obtained

The Goldschmidt alternator has been in use for some

time past, particularly at Tuckerton, N J, and Ellvese, (actmany, giving excellent results Driven by a 220-volt, 230-horse-power motor at 4,000 revolutions per minute, the Goldsehmidt atternator supplies radio-frequency currents The accuracy of construction of such an alternator is extreme, indeed, the air gap clearetween rotor and stator is but 0.03 lnch, and a

since netween rotor and attack is one to to since, and a deviation from parallelism of one part in a thousand causes the output of the machine to be reduced by one-fifth As far back as 1008, Dr. Fluiost F. W. Alexanderson of Schenectady, N. Y., constructed an alternator delivering approximately two kilowatts of 100,000f-cycle current. The rotor of this alternator made a speed of current The rotur of this alternator made a speed of 20 000 revolutions per minute. In actual speed at the worked on high frequency alternators, and all this work worked on high frequency alternators, and all this work has finally green both to the present successful generators. The advantages of this tipe of generator are numerous. For one thing it gives a steady, uniform supply of radio energy, which only need as to be controlled by telegraph key or mitterpolium amplifying out uit, according to whether telegraphy or telephony is sought

### Telephoning Through 3,200 Miles of Space

Recently Dr. Alexanderson's apparatus was employed by the Navy Department at New Brunswick for transmitting wireless telephone missages to President Wilson on board the transport. George Washington, at Brest Trance or over an air has distance of 3, 200 miles. And

according to this leading radio engineer, this is by no means the limit for wireless telephony, especially when better facilities are availuble

The station at New Brinswick, employ ing Dr Alexanderson's high frequency alter nator, may be used cither for wireless telephone or telegraph messages without alterations, and for simultaneous trans mission and reception of either The 22,000 (yeles, and the only moving part is a solid steel wheel without wires or copper conductors, constituting the rator. This member revolves at 2,100 revolutions per minute The output is 200 kilowatts, and the emitted wireless waves have a clear-out whistle or flute-like sound, with no har-It should be remembered, how



At the left Recoiving trans Atlantic messages Above Operating the special perforating machine which pe Views of the trans-Atlantic room in the new Navy Department Building in Washington, D. C.

ever, that there waves are insaudible bespites of their lingh frequency, and special means are broughyrid at the recurving safe to convert them interactions, per them interaction explains, have various frequencies and different wave lengths, and interfere with other station. They are uncless wave lengths.

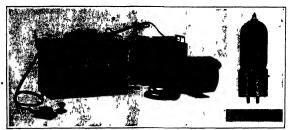
which frames aguals in conjunction with his alternator, Dr. Alexanderson makes use of a magnetic amplifier, which builds up weak currents until they become sufficiently powerful for long-datance transmission. This device contains on moving parter; magnetically, it controls the output today of a telegraph key or microphone. As far as the 'syman is concerned, fit magnetic amplifier may be deserthed as a special 'orne

of transformer
Still another feature of the
Alexanderson system; is the
unditple-transformer in the
unditple-transformer in the
unditple-transformer in the
particular and to purify as well as
samplify the patitudiar tone
or vibratory it quency of
the stations agenerator. Dr
Alexanderson makes hos ural
in electrical harmoniv with
instrumenticity, whereas the
sees any hard of a strail for
handling the transmitter,
coverlations A studable ansoligation of a strail for
handling the phonograph the
theaper machines are mirely
assembled, with any reproduter, tone arm, horn, and
uner, tone arm, horn, and

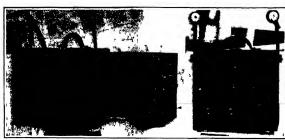
cabinet being brought together to form a machine. The more expensive machines, which really reproduce some

thing like the living sounds are not merit uses while they are carefully belanced. Each part is hadacted samust some other part so that the acoustic ensemble is a perfect unit. So with the Alexanderson transmitter and serial, buy must agree so that there will be no opposition or depreciation. As a result of this belance to range is greatly increased. Intrien poles (ach 400 feet high, are employed for the acrual at the New Brunswick Station.

The Alexanderson system is also employed in the powerful wireless station at Lyons, France which has been handling the official United States Covernment traffic between the two countries. The aerial of this station comprises 20 parallel strands of phosphor bronze table extending over a distance of 2 100 feet and support



Typical wireless telegraph and telephone set for airplane use and a typical vacuum tube used in receiving



Interior and exterior views of a wireless transmitter for airplane use

ported on cight steel masts me or m. 16 M feet in height. The station makes use of several transmitting sits manch, a 190-kilowatt false, builts in high frequency alternator, a french high frej i valermator of the Bethenoid disagn and of the sum capacity two 24-kilowatt flwell are generators in 1 two 190 kilowatt speak sets if its undicated that it was high frequency

### vacuum Tubes The Modern Alladio's Lamp

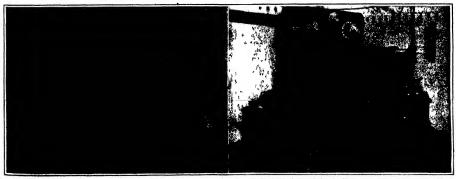
And now we come to the us strumarkable developnent in radio communication. The vacuum tube Many vians ago. I these discovered that when an electrole was inserted in an ordinary electric ball and the lahment bated to invaridoscence, our it if lived from the filament to the electrode. In other words the lamp beames aum-directional conduct r and was thus await able (or cortifying purposes I'his phenomenon has since become known as the 1 dison effect

With I dison numerous pronouncit in ventures took up the I dison effect and studied at what view to make ug some uses of this simple is the I dison consistent away to the I again it White Armstrong Chaff Chij is and others. The strey of the gradual developm at of the xacum tafe use it is commonly saided as a large on the properties of the control of

Then it was that the telephone interests with a view to improving their long-distance service by introducing means of repeating or amphifying weak currents, leaded to investigate the vicinin tube. I rom a comparatively crude instrument the tal phone engineers with every facility available for extinsive resided and experi Son Evolved highly ment woon evolves mgm., perfected vacuum tubes with his came competitors of the so-called mechanical repetiter which they are rapidly displacing Ordinated to the blume communication. ary telephonic communication is not feasible over 500 nules without some means of repeating or relaying the attenuated current coming from the transmitter. Thus for distances between 500 and 1 200 miles two amplifiers or repeaters are empleyed. In speaking through

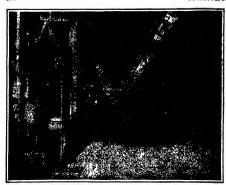
picyed. In speaking through to San Francisco from New York city a person s von travels through six vacuum tubes

travis through as assume tubes. And which the vacuum tube and specific of oran, and which the vacuum tube in its perfected foran, and the large temperature of the perfect 
(Continu 1 is page 181)



At the left 80me of the receiving apparatus which to all indications is by no means the last word in the art. At the right Powerful arc transmittees

Two views of the Mets wireless station which the Germans surrondered to the French elace the armistice





Mixor unit in the phosgene plant

Filling Livens shells with phospens

## United States Chemical Warfare Service—II

#### The Great Gas Plant at Edgewood Arsenal With a Capacity of 200 Tons Per Day

Nour issue of March 29th 1919 we dealt with the construction of the great toxic gas plant at Pdgewood Arsenal Maryland where in considerably less than Aresnal Maryland where in considerably less than the week months of active construction we built from the ground up a vest establishment and developed as industry stativity is we to the United States At the signing of the armster I dig wood had a capacity of approximately in one hundred tones of gas per day and by the closs of last year would have been in a position to ship to the front the enormous output of 20 tons of gas between per day and maintain that rate of supply continuously. The significance of this will be appreciated when we hear in mind that the total lails capacity of the German chemi al plants was only all out thirty time per day.
In addition to the manufacture of chloring and mustaid.

gas as described in the procling clapter and massard plant was in a position to produce large quantities of phosque and obbig error it is no made a shall filling plant of large aproxis and a pointer plants for filling hand granteds with both gas and smoke producing materials and for manufacturing incombiney bonds and Also there was built a very fine chemical labormars Asso intervals may not a very fine the measurement above that a description of the measurement and of the different sections of the work wide determined and a large amount of research characteristic of the rottin of the matters were curred on. The work of this kind previous with construction of a laboratory at Edgewood was lone by placing the members of the labor-

atory force in various laboratories throughout the country, and notably at the Bureau of Standards, Washington, Johns Hopkins University, and the Ohio State University

#### The Manufacture of Chlorpicrin

Much was heard during the war of the gases used by the Germans to temperarily blund the enemy by acting vigorously on the tear duets. Ihis was commonly known as 'tear gas'. At allogic was there was built a viry complete plant for the mit ufacture of chloriperan, which not only has a strong lacels under viry complete plant for the mit ufacture of chloriperan, which not only has a strong lacels under viry the stronger explosive of the complete shilled with this gas a i thir a stronger explosive more considerable with the gas a it that the properties of the complete complete the control of the complete complete control and the complete c Much was heard during the war of the gases used by reaction taking place in wrottel true digesters which are furnished with condensors. Stong as the temperature of the fraction romains within the very definite and limited range in which the (bit into in the bleaching powders reacts upon the calcium pirate the reaction takes place very evenly. But if the temperature passes outside of these limits, the 1k aching powder liberates oxygen in place of chlorine and the entire mixture foams

over into the condenser

When the reaction takes plus as intended, the chlorpierm distrib out and is separated from the accompanying

water after being conveyed to settling tanks and allowed to stand in them for a few days. At a plant which the Government employed at Stamford, Com, the pferie acid was produced from phenol and was used directly in making chloryerin. Priere skill for the Edgwood plant was provided from other government plants. Chloryerin was used as a filler for all lunds of projectiles the shells sometimes being filled entirely with helpering had at other times containing a maxime of

chlorpictin and phosgene or stannic chloride

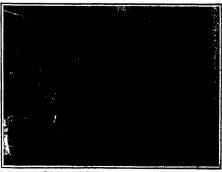
#### The Manufacture of Phos

A most effictive gas, because of its high toxic power, is phosgane, and the plant erected at Edgewood had a capacity at the close of the war of 40 tons per day. Two additional plants were practically completed which would have brought the total capacity at Edgewood up to 80 tons per day. The Covernment was also supplied by a plant operated by the Colbiny Electro-Chemical Co., which made use of the earthou-monocude from its descriptions. co, which make use of the earthon-inconcide from its phosphorous furinaces, and this plant contributed ten tone per day part of the output being loaded into projection at the plant and the rest of it shapped abroad in steel containers. Also a plant at Brook, N. J., was turning out some five tone a day which was shapped in containers to the Allice.

Phosgene has a very strong delaying action upon the heart which may prove fatal even after the first effects seem to have disappeared in the manufacture of



Filling 75-mm shell with mustard gas



Painting gas shells as they pass on moving trellers

the reaction of dicaide and carbon as of oxygen and carbon in a gas er from which pure monozide is obtained e quantities Destruc eratures are avoided by regulating in the process the relative amount used of orever and carbon The pho-

e phosgens plant at wood consuts of a car-

sogewood consens of a car-bon-dioxide plant with a daily capacity of 125,000 edilo feet of carbon-dioxide and an oxygen plant capable of producing 200,000 cubic feet of oxygen every 24 hours s producing 200,000 cubo feet of oxygen every 74 hours four produces gave a total daily output of 400,000 cubic set of carbon-monoxide. The carbon-monoxide and abortise then travel over a sacbron catalyses, and the Bosgene is produced with a tendency to very high mapprentures which is restrained by cooling. The consumers is then liquided by passing it through com-tractions of the contraction of the contraction of the The cuttent of the contraction of the contraction of the The cuttent of the contraction of the contraction of the The cuttent of the contraction of the contraction of the traction of the contraction of the Theorem the contraction of the Theorem the cutter of Theorem the Theorem the cutter of Theo

The output of phospene at Edgewood was used in lang standard shells of all calibers, Livens projector bombs and Stokes mortar bombs Big shipments were made to the Allies in wrought-iron drums or containers, each of which held 1,700 pounds A large group of these is shown in one of the accompany illustrations

#### The Shell-Filling Plant

The shells and bombs for carrying the gas into the enemy's trenches and into the torrain back of his front were shipped to Edgewood from the various shell plants and stored in large dumps, from which they were taken as needed to the shell-filling plant, which was designed for the filling of shells of all calibers from 75 mm designed for the filling of shells of all calibors from 75 mm to 240 mm. In order to make sure that the phosegene was manitained in a liquid condition at atmospheric pressure, the shell-filling plant was equipped with the necessary refrigerating appliances for reducing the temperature of the phosegene and of the shells The shells to be filled were brought by converous through the temperature of many filling the properties of the phosegene was 0°1 and unleaded in the properties of the phosegene was 0°1 and unleaded in the properties of the phosegene was 0°1 and unleaded in the properties of the phosegene propert rooms in which the temperature was 0°1 and unleased in front of the filling machine at a timperature well below the boiling point of the gas. The filling machine of whele we show an illustration is arranged to fill as while as a time and the filling is done within a glass-taclowed cabinet. The liquid phospoon, is divivered by small tubes into containers of the exact capacity of the shells which are filled as at a time. The shells are by tright which are filled six at a time. The shells are brought into the cabinet on a trolley and they are so placed that the heads of the shells register correctly with the outlet. of the flasks above. The cabinct is so urranged that the discharge of the contents of the flasks to the shells can custanger of the contents of the makes of the same can be regulated by an operator outside the calinet and means are provided by which not even a drop of the liquid can fall outside of the shells. The shells are closed by compressed-air motors. As soon as the set of six is filled, the trolley passes out of the cabinet, taking the filled shells with it

The next operation is that of painting the shells with ortain colored bandings which show at a glanc the nature of their contents. Painting and striping were done on an endiese conveyor, which carried the filled shells in front of a nimbr of operators, each of which performed his share of the work. It is needless to say that every part of the plant for shell-hilling was most



Spray-cooling water for the condenser

carefully ventilated, the tul gas being washed in lofty stone-ware towers which are onstructed on the lines of the standard silo

The shell-filling plant has a capacity in 24 hours of filling 80 000 77 mm shells 10 000 4 7 mm, 50,000 155 mm and 4 000 8-moh shells



Charging tanks with phongene gas was hazardous work, calling for gas masks

In conclusion, we wish to as that among the many In conclusion, we what to a left among the many great industrial plants whi is a base of from time to trine we do not recall any offer governmental work which surpasses thus in the in flighest pravious with which it was laid out, the aper lawfit which it was creeted, and the berte period of time in which production on a large scale was accomplished. We wish to re aftern our

conviction that the Govern ment should regard the Ldgewood Arsenal as a great military asset | The cost of a few carctakers would be in significant and we believe that a far sighted policy on part of the Government would see to it that the plant is preserved in such condition that should any future call f : military mobilisation area it could be put into memediate operation

#### Training Field Workers in Eugenics

DIRECTOR C B Davemport of the Fugures Record Office on Long Island, assisted by Dr. H. O. Langhlin, has been giving every summer since 1910 a six-weeks training course for field workers in cugents. The course comprises 25 lectures on human beredity and engenics, with special reference to conduct together with laboratory work on charting family pedigrees tracing the descent and recombination of human traits in pedigrees statistical studies on variation in plants and animals, studies in the elements of biometry tte (linical studies are made at institutions for various types of the socially inadequate

#### Personnel Work of the United States Army

THE principles and methods developed by the Committee on Classification of Personnel in the Army anve occa summarried in an exhibit with its being shown in various cities. At present or up to April 12th the exhibit is at the Lagincering Societies Building 29 West 30th birect New York City I consists of a collection of wall tharts forms photographs and models showing how the Army finds out what kind of work inco. can best do and how it places them on such work in so far as it is needed in the Army how men who claim to have skill in trades essential to the Army are tested to develop the extent of their skill how the intelligence, takent and skill available are distributed throughout the different Army units how officers are classified to ascer tain their special abilities how they are rated for effi-ciency and how this information is used and the general issults of applying modern personnel methods in the

Army during the war The exhibit was prepared by the Adjutant General's office at Washington for the information of officers and eigh as in that city where it regived such favoral is attention that in respons to many a quests the Adjutant attention that in response to many requests are supmand General consented to its display in other cities. Very appropriately it is being shown under the mappers of the United Engineering Secrety representing the four great appropriately teleproper shown under the inspires of the limited Engineering Security representing the four great Linguigency Societies and the National Societies and the National Societies which represents a tief the first successful attempt at instandard, the study on Linguistic Societies and the study of Linguistics of the Societies of the S gation of the relations between employer and employee Over fifty differ at industries in represented in its membership their mutual purpose being to increase the efficiency of the industries of the United States through industrial training and to supplement the edn cational efforts of the Public Schools. The Association, through its various sub-committees, conducts intensive study of all features of employment and training and promentes vigorous activities for the channation of waste through unnecessary labor turnover through lack of proper training and unnecessary sickness and accidents







Pheagene in wrought iron drums ready for shipment to France

# Admiral Sims in the Team-Work for Victory

How the Admiral Stood Out for Consolidation as Against Mere Cooperation

PAROM the very moment that Admiral Surse took command of our Turopean of Foreign the weak of Foreign these with are typically bear versal to foreign which are typically bear versal to foreign the three foreign to the foreign that the foreign that the foreign the foreign makes foreign with the foreign makes with which they bear in a fette war. The walls of our vehal versal backers all more sometime of peece tegether with the type dish American have clearly with 1 bear the foreign that the same foreign that the f

those extending in their maxis.

It was not trust and quite the expected that when counshaps were regime, as no methods and past tess were
sufficiently through a so methods and past tess were
sufficiently through a test many of these methods
and past is were maderial far superior to the
methods and past is set in making the size methods
and past is set in making the far superior to the
methods and past is set indicated far superior to the
methods and past is set in maxis and in vogace in the foreign
maxis. It was also received that a spirit of competition
and revalvy shift it in estart to grow up. It was
then free to keep tell and was quite natural that our
than till settle of sour set limition about thereby mass
and the superior that the superior to keep our
shapes up a stell from four far ship is to keep our
shapes up a stell from four far ship is to keep our
shapes up to the far makes to that the work for did would
be the arts contrast if will the work of other naives. In
part of previous of maxis questions of prise and
prestig are meytable factors.

Admiral sims polici s were aimed to cover all of the above, and many other points which always cust in allied joint operations and for which there naturally cannot be any previous training in time of puse. It is perhaps natural that his policies have been misconperiage natural that his policies have been miscon-

strucd by many who were not acquainted fully with the most unusual encurstances of such an impreiedented war

At the very outset he iteaty set forth that the on an and only task confronting our ships was 'to defeat the item's way to defeat this out outstanding aim Questions of pride, presting, relative between the constitution of the item's way to be 'team-work Whorever possible our ships and men were not only to cooperate with the foreign ships and men, but were to consolidate with them

into one team
I xcept where absolutely
necessary, our ships were not
to build up duplicate ad

inmist stave organisations duplicate lines of communication, duplie the supply stations, (i.e. Here was a natural tendeuty to build up our own as parate supporting systems on that whatever show we cutrical into would be our own. The Admiral preached that the best way to win the war was to take conditions as we found them and work with them thereby not only asying great and unincoossity express but also saving long of laws which would be given by the world to the start of we had to wait for this and communications of the start of the

The Administrated at clear to his officers that their game was to avoid delay in litting the entiry and to step at nothing no matter what they had come to behave in the pest which would diminish in any way their throwing their maximum weight into the scales without delay line was time means ever thing. I me as an all-important factor. He this other fellow first—the laster and quicker you defeat his going the sooner the serifies of presons life the west, and expense of war are over. Most earnestly he pointed out that it did not make any difference, what our ships were doong,

IT is not stretching a point foo far to vay that the greatest ally of Germany, during the first four years of the war, was the lack of a unified command among the Alliad armites apposed to her Admirad Sims has sarried the lasting gratitude of the nation at large and his brother officers in particular, because he stood for the closest consolidation under single leadership, and not merely for simple cooperation with our Nual Allies Only thus, as the event has proved could the quick defeat of the submartine, the capture of the High Seas Fleet and the transfer of 2,000,000 American troops to Europe hope been accomplished

what ships they were protecting or where they were working is long as they were hitting, the entern to the best advantage in speeding the day of victor. As to difference in methods and practices, I foreign so were the British service was the principal one concerned simply because it was by far the legislat and hence the one with which our Navy naturally came in the most contact. He mested that it be decided in genural Allied council as to where our ships would be decided in genural Allied council as to where our ships would be decided in genural Allied services.

Admiral constantly directed the point of view of bis officers to the following inneumal Inter. We were gradly outnumbered in ships, mea instead and excry thing else in the game. In excry plane the other Iellow who outnumbered us, had been at it for nearly three long view. In other words we were cuttering a war in it last plane, not in the Examining. He excry quest ned but that many of our net tools and practices were superior to the corresponding ones in the older were superior to the corresponding ones in the older the immortly and the of the claim but be the claim.



Presentation of a parting gift to Admiral Sims in London

adopt our methods or to convert them to our views. The task of persuading the other naives to change their methods would simply savolve fort motion and delay the war was no time to try to cloust nor obligage the other fillow. Hence all of his officers were directed and encouraged regardless of red tape and regulations, to unherstandly drop, for the time lesing, their own could be avoided, and the enemy hit the harder. Of course, 100 per cent efficiency could not be expected. We re we could be avoided, and the enemy hit the harder.

Where a could work our methods in without consequence of delaying the game or easuring fretone—fine—pa shead. In other words, Admiral Banas policy was, that in any game of cooperation, concessions must be made. All parties may be heard at the Countil Table, but when it comes to action one side must give will This is the principle of unified command, later adopted on the Wateria I rout and medicately it is the guiding principle.

recipie of all successful enterprises in cut life.

Admiral Suns prached a do trane easily misconstrued by those, who did not fully understand—but doctrine was that as we were decadedly in the minority, we should be the quicker and show the greater willingness to give way in our arguments and contentions,

and this for the good reason that our sime was not to prove our case, or to prove our superiority in this line or that line, but select you defeat a common ensury. He repeatedly said, "Never maint a but set our sith the war." It is difficult to suplain but nevertheless, only too true, that Admiral buts path, in crisungs that such policies as the above were carried out, was not strewn with rower. It would take a volume of no small size to chronice the troubles that arose or tired to arise, or the obstacles which near the distribution of the property of

Nates declarad war, he stood out for the above policies in all of he work, not only with he own ships, officers and men, but also in his dealings with the breaks and the organizations of foreign navies. In other words he at ourse adopted the policy of numbed command, which latter strated so much world attention whan it was announced as being adopted by the armies in the facility.

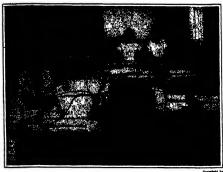
Adhural Suns took the stand in the Allied Council chambers that his forces should be looked upon as reserves being brought up to the 'front.' That where the should go and in what numbers should be determined only after frank discussion by corporate concurred and should be based only on the general and strategical situation and with the sole end in view of sunning the war. This policy is quite opinion of the should be should be soled only on the general and strategical situation and with the sole end in view of sunning the war. This policy is quite opinion at the sole in the s

nations and being separated from its own traditions and methods However, such were the conceptions of our principal naval commander in the war, and who can question the high motives and unselfabness which they

Results only count, and now that the war is over the fact cannot escape that our Navy in the war under the leadership of Admural Bims, has come home with nothing but praise and admaration and respect from the foreign navies with which it has worked Practically no work of the worked Practically no work of the search of the search and the search and the search and the search and the search the search and the search the search and the searc

not to allow these criticisms to interfere with his continuing to be governed by his own convictions based upon his experience.

(Continued on page \$84)





In the army clothing factory making stencils with electric and gas tools that perforate the paper to the required design

Welding aerial bombs—a man's job done as a man would do it, by a woman with a man s heart

## British Munitions

A Glimpse at a Picture Too Big for a Single Canvas

By C. H. Claudy, Special Correspondent of the SCHNTIFIC AMERICAN in London

HANGING on the wall of our of a thousand of tag Sir Walter Ralcigh

"Whoseever in writing a modern instory shall follow fruth too near the heels it may haply strike out his teeth

Written in 1614, it has lost none of its potency in 1919, especially to him who would attempt the impossible task esponsity to him who would arrempt the impossible task of painting a true pricting of Grait Britains numbtions work in a single article. The prison twriter needs his subject to the prison of the prison of the many that the prison of the pri

be does not follow? 'I rulk too is not the her is.

To get even a faint did in the program it seems fairly
obvious that one first envisage whit. Mustutous traces
if it ineans guns and shells the narwer is simple—the
Ministry of Musitions will supply no figures until a
peace treatly has been signed. If it means all war maternal, then the pages of one issue of the Nethersit and
AMBRILLAN GOULD find the mere statistics of they were available

The act establishing the Ministry of Ministions was passed on June 9th, 1915 and special powers were con-ferred upon the Minister of Munitions by an Order in Council dated June 16th 1915, the Munit one of War act 1915, and subsequent acts and the Differe of the act 1915, and subsequent at its and the Difface of the Realm acts. Mr. Lloyd (norge took up has work as Minister of Munitions on May 20th, 1915, the nucleus of the new department being formed by the staff of the Cabinet Committee on Munitions together with that of the speeml organization established at the War Office under Lord Kitchener for the development of mu miton supply, known as the Arnamental Output Com-

To these were rapidly added certain older sections of the War Office organisation. This process of trainfer from the War Office was carried durther in ister months, and by the and of 1918 the scope of the department covered the supply of arms, ammunition, explosives, optead munitions, materials, trenth warfare supplies, opaca munitions, materials, trenth warfare supplies, munitions contracts, muutions finance, impection, in vention, dasign and the administration of the Royal Ordanace Factories, these functions being in the main, duties which had formerly been exercised by the War (Man.

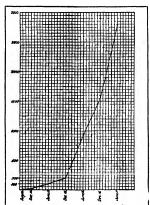
During 1918 the Ministry of Munitions was entrusted

During 1918 the Ministry of Munitions was estrusted with further responsibility for the storage of gun ammunition, supply of tanks, supply of tractors for heavy howtesers, supply of realway materials for the army supply of mechanical transport vehicles, and the supply of chemical glass and laboratory ware. Since December, 1918, these functions have been turber extended to include the highly important department in charge of the supply of heaver-lhain-sail strengt for both land and naval services, as would acknowledge and the Beard of Agriculture Since June, 1917, the

Ministry of Munitions has its it is just firth supply of fuel ods

Its ems furly obvious that that in steam department needs not an artist later nevel of test. But perlaps if a few high spots a tan helt the radio may gain some perspective in the relation of its partial in ot of its past propertions

During the last part quage of the left set is



Graph showing the increase in production of munitions by weight

purposes of comparison the production in June 1915 who

Great Bretain's guns used up 1º 00 time of ammunition derign Bright spins used up 1 to 17 ha of animum to daily Norther then nor any time since the dark days of the German offensive, has treat Britain expinded ammunition faster than it could be supplied. During that German offensive the English army lost in one week 1,000 guns—and less than a month later had 1 500 new ones to take their place We are fond of talking about speed of production in the United States, but the Briton speed of production in the United States, but the Briton has certainly little to learn when an armed foe is mena-

is liss shall not gatty and his pride is touched that a Huncian greath in exerted and unfread. It we put have made him not as to just what a single rand of commutener them can from the manufacturing collowing but spirit from the obvious things, such as shell one explaint etcholory a single round. can be manufe tured it is ne essert to ol tain and work up onery at ne ery lite calcium carbide magnesite. up tinery state ery life ciderin carbide magnetide, wolfram ere ecton cord romodum nekel bautet, infinites oil cittai untimery and many other items from different countries. Lorgings and castings must be supplied as well as brass rol and stampings, an in-finity of machining of craft ins must be done, along with the supermittedence of equipments the ordering of the machinery the manifecture distribution and supply and use of hundris for gages the assembling of in gridents from difficult works in appropriate centers the calculates of the raw material the arrangements for transport in 1s forth

I urther to elaborate on the complication of shell a ammunition manufacture consider a few figures for the inspects a service which the factories in 1 igland pos to see that what is turned out is as right as human care

In July 1915 the staff of the Inspections Department in fully 1915 the stall of the Inspections Dispartment consisted of 8 701 persons. In June 1917 it consisted in Lingland of nearly 10 000 with an all-litting staff in the United States of more than 8 000. Women are employed in every possible way. In March 1916, they composed 28 per cent of the staff in June 1917, they composed 61 per cent numbering 20,000 and they are employed on slinost all operations except those in which special technical experience or physical strongth are required

The work of inspection is often very tedious and When it is remembered that there are no monotonous fewer than 183 000 000 separate giging operations for every million rounds of shell it can easily be seen why it requires both many workers and great fidelity to ac

curacy in the work There are in Great Britain-or were at the time of the armstone upwards of 20 MM factors enough in main tions work cellusing. The visit imports of these of course, were private factories operated under street Government control. The Ministry f Munitions has full and country in the first of the course, were to left itself to any factors. take any labor, commandeer any machines or buildings that it meds and it is only fair to say that this enormous power, perhaps greater than that possessed by anceint hings prior to Magna Charter his been used with the single-minded distort to win the war and with a resulting fretion and discutent so small as to be a matter of amount on it to the American observer whose maliciable right it is to grunnlic at his government even when most enthusiastically supporting it M ist important of the factories the factories the national factories. On the 31st of October, (Continued on page 184)

# Mechanical Equipment of the Farm

Latest developments in agricultural machinery and practical suggestions for the farmer

Conducted by HARRY C RAMSOWER Professor of Agricultural Engineering Olivo State University

#### An Acetylene Table Lamp

ACITYIINI has been used for many A source of light for term homes and it has given a high degree, of satisfaction. The homes is piped very much as for natural on artin oil ges and a large-sated ginerator used. Researching the high quality of the acception flame to two minimums have attempted to build a table lamp. The accompanying figure shows one rather successful type. The carbide is contained in the upper chainler and the water in the lawer chamber it being a carbide to water field Granulated carbide is used. The stem of the automatic feed valve is seen

us used. In section in the authorithe lead valve is seen that to the right of the burner tube.

A 3-foot burner is used with this lamp, which burner generates 37-candle power. Burners are designated by the number of cubic feet of gas consumed each hour. With carbide at four cents per pound and kerosene at 12 cents per gallon the cost of operating an acetylene lamp is about 20 per cent more per candle-power-hour than for an ordinary round wick kerosene lamp flame of the activiene lamp is so much better than the flame of a common kerosene lamp that the added cost s of small moment

#### A New Tractor Dynamometer

WITH the rapid development in tractors and tractor tools there has come an increased demand for a machine capable of measuring the pull of the tractor and the draft of other nuplements. There has been a notable lack of experimental work done on the draft of farm machines and one reason for this condition has been the absence of suitable apparatus for performing the work assence of suitable apparatus for performing the work.

A new dynam inter hose just been desgined and put on
the market by a company prominent for years in railway
traction test work. The instrument is
quite complete and buds fair to give a high

degree of satisfaction
This dynamineter makes use of the hydraulic prin tile that is, the pull is measured by the degree of compression of a liquid contained within a vlinder idea is thought to be more reliable than the use of springs of n kind rinother use or springs of a kind of instant. The dynamometer prop is the part which measures the pull is shown in light. I has is list lied between the motive power and the to I being test it. The levis to the right is come to it the jist on in the extender. Under the cys pill there would be some be kage (cf. al. (the higher well as the part) is shown at (2) which is used to return this cil to the cylinder. As the liquid is congressed the force is transmitted through a flexible tube connected to the cylinder at (1) to the recording apparatus lig 2



A table lamp that burns acctylene

A puston (4), by means of a system of levers, further transmits this compression to a pencil (5). This pencil plays over a sheet of paper carried on a large roll motion of the paper being secured by means of a 21-inch wheel running upon the ground. In testing plows this wheel runs in the bottom of the furrow. The pen at (6) draws the soro or datum line and the distance between this line and the mark made by

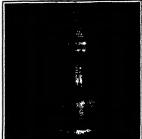


Fig. 1. The dynamometer proper which measures the amount of the pull

the pencil (5) gives a measure of the intensity of the In order to secure the average pull, it is necessary to obtain the area between the zero line and the line described by the moving pencil. This is done by the automatic integrator (7) which makes electrical contact

automate integrator (1) which makes electrical contact through the relay (8) every square inch. The relay closes the circuit operating the pen (9) giving a record on the paper, which record is tallied by the counter (7), so that the total area of the curve may be secured in-stantly at any time during the test

A time clock in connection with the recorder makes A time quok in connection with the seconder makes electrical contact every 10 seconds, thus operating pen (11) which gives a record on the paper at this faterval Pen (12) is operated by a push button and esablies the operator to indicate at any time any portion of the curve which for various reasons should be soluded from the

The results are easily calculated. The area record divided by the proper travel gives the average height of the indicator eard in inches. If this is multiplied by the indicator eard in inches a penul movement of one force necessary to produce a pencil movement of one inch and this by the ratio of the area of the dynaince and this by the ratio of the area of the dyna-mometer piston to the indicator piston, the mean pull in pounds is determined. Having the time record and the rate of travel, the horse-power developed is quickly determined. A continuous record of 5,000 feet can be

To prevent the delicate mechanism of the recording apparatus from accidental injury or from being clouds apparatus from accidental injury or from nemg congave with dirt it is placed in a light motal case, as shown in one of the pictures. The machine can be carried by the convenient handles or may be placed upon the machine being tested. It has an aluminum base,

terrally

which serves to decrease the weight ma

#### Sorghum as a Coloring Material

THE French technical press has lately been full of a very interesting con munication made to the Academy of Sciences by M Piedalu It deals with the utilisation of sorghum as a coloring material The "giumes or husks of sweet sorghum and those of sorghum with black seed hitherto of no use at all, are found to yield a gum with very fine she found to yield a gum with very hine shades of color ranging from pink to bright red, salmon starlet, pearl gray, dark gray, dark gray, and khakt all colors which, being sun and soap-proof are highly suitable for dyeing wood, silk, leather and vogetable fibers. The discovery of than used vogetable fibers the discovery of the new dyeing material it is stated, is one of grad importance, and steps are to be taken. to work it on a large scale

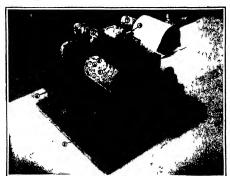


Fig. 2. The apparatus which records the pall

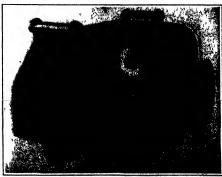


Fig. 3. The recording mechanism enclosed in a diri-proof case

# Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts



The mechanism that distributes the mixture to the proper height and crewn before tamping



The machine for finishing concrete roads, showing the operation of the tamper

# A Mechanical Finisher for Concrete Roads

A MACHINE which will automatically artike of, tamp and finish the surface of a concrete road has receilly been brought to a point of perfection by a fewering of the surface of a concrete road has receilly been transitioned to a point of perfection by a fewering of the surface of the work of more than a dosen men and do it so that the finished surface is mechanically perfect and free from slatance, sait or light particles which float to the top of the mix of cenent is too wet. One of the chief advantages of the machine as its ability to finish the surface. wet One of the chief advantages of the machine is its ability to finish the surface no matter what consistency of mix is considered to be the best for the particular work in hand. With hand-finishing it is always necessary to employ a slight excess of water but this is detrimental because it reduces the strength of the concrete.
The apparatus consists of a metal

frame work carrying a four-horsepower gasoline engine inside of a protecting shoet metal box in the center. The entire machine moves forward at the rate of seven feet per minute and backs up at the rate of 28 feet a minute by power secured from the gas engine and driving through a system of chains and sprockets to the four wheels on which the apparatus is carried

wheels on which the apparatus is carried. The finishing operation is done in two separate stops and two distinct parts of the machine, the amper and the strike-off to which a left float is also connected. The strike-off apreads the concrete to the necessary height and crown. The tamper, a paddle-like affair is located at the rear of the machine. is located at the rear of the machine between the gasoline engine case and the strike-off board. The first time over, it tamps the concrete with a long, hard stroks. The length of the stroke may be regulated by the operator so that on the second time over, the concrete is subjected to a continuous agitation without exerting any pressure on the mixture This tamping compacts the concrete said trings the air to the surface and tends to bond the stones with just the proper quantity of cement. The final finishing touch done done by the float, a belt attached to the strike-off and moved over the surface to

# Making Smooth Hard Boads with a Snow Refler

ONE of the greatest obstacles to traffic in some of our northern towns is a heavy fall of snow, with no facilities for clearing it eway. Under such circum-

stances vehicles simply flounder around until the ordinary traffic has packed it down. In at least one town, however Laconia, N. H., this difficulty has been overcome by means of a heavy roller which hastens and systematises the hardening process. It is the invention

Don't remove the snow-pack it down hard and go sleigh-riding!

of Charles A I rench the city engineer of Laconia and has been successfully employed for a number of winters

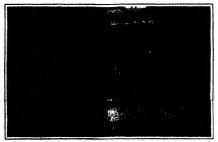
employed for a number of winters.

The roller consists of two cylindrical wooden drums, each 6 feet 4 inches in diameter and 5 feet in length mounted.

The roller is drawn by four or six raca and three or more men are required the persist of one to drive the horses and the three to go she id and showd when I my drifts are encountered. The show it is also level sliding places and chuck

on an oak frame and surmounted by a stat and tool box. Thus the combined

drums give a snow-compacting width of about 12 feet. In Laconia the device is used principally for breaking country and is sent out when there is a fall of four mobes or even loss when at has drifted



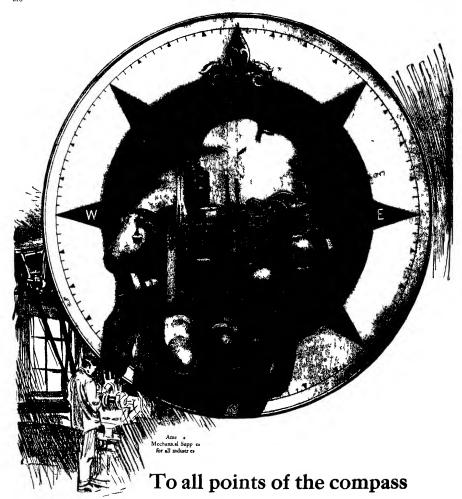
The delousing plant at Camp Devens

holes and when the roller passes over it notes and when the roles passes over its compacts the snow so that it will hold a team and the roads need no more atten-tion until the next storm. So hard is the snow packed down that in the spring when the snow begins to thaw, some of the depart drifts have to be cut out with a road-machine. In the city, after the sidewalks have been cleared by the snow plows the ridge left at the edge of the sidewalk spread over by means of the road machine and then rolled by the snow roller

#### Eliminating the Cooue

THOUSANDS of pedicule restiment and more thousands of pedicule capities drived from the battlefelds and tuchels of burges are the prospective victims of the new del using or coolerate the pedicular of the new del using or coolerate the pedicular of the new del using or coolerate the pedicular of the new del using or coolerate the pedicular of the new del using or coolerate the pedicular of the new del using or coolerate the pedicular of the new del using the pedicular of the new delivery of the new de killing plant established at Cump Devens as part of the Sanitary Pro ess I but As thousands of soldiers will be temobilized during the next few months at Dayons encluding the cutire 26th or Yankee Division of 25 000 mm there will be constant daily use for su h an outfit It is one of the most in ideni of the many inventions evolved by the experts of the United States Army and better than the original crude affairs that were estab-

France Germany Russis and Serbin All returning soldiers from the trans-ports that will diek in Boston will be sent to Camp Devens for demobilization after to camp bevens in demonitzation inter-thorough quarantine which includes the delousing process. I very sidder his to disrobe. His clothing and his belongings are all thrown into his barracks bag. are all thrown into his birricks bag. The cooles get it either way whether they must on strying with the solder or with his effects. With the former they will be scalded to death or dr win d out for the solder has to undergo a hot shower bath with plenty of so ap. With the clothing they will be scalded by live The clothing and the effects in the barracks bags are thrown into a huge exhindrical wire busket shown at the left of the picture — It accommodates 70 bags Once filled the basket is rolled to the death chamber said chamber being a long steel tube connected up with pipe supplying hye steam. The basket and its contents are scaled up inside the tube by huge stret doors and the steam is turned on for forty minutes After this the basket ior forty minutes. After this the basket is removed for the contents to cool. The bags full of clothing and other impediments of a soldier are delivered to him dry but still warm—slightly wrinkled. and shrunken, perhaps but clean



POR many years The Fairbanks Company has satisfact r ly served Purchasing Departments r the ent re in lustrial field—such purchasers as mills factories m nes railroads and steamship lines

Branch Houses are ma neared in principal cities In each of these Branch H uses an immense range of products together with efficient auto truck service is sures prompt deliveries The individual Branches have complete facilities for any needed after service. No similar house has won the world wide standing enjoyed by The Fairbanks Company

MOST people know Fairbanks Scales But it is not generally understood that The Fairbanks Company also markets Mill Supplies, Valves, Machine Tools,



Transmission Trucks and Wheelbarrows Engines and Pumps, and other mechanical products of a quality which entitles them to bear The Fairbanks Company O K

Fo carry on this work, The Fairbanks Company, as stated above, now maintains 22 Branch Houses in leading American cities. Here business is done both at wholesale and rettal. In addition, prominent dealers in other cities handle many of the Fairbanks products.

Foreign Branch Houses are maintained in London, Glasgow, Paris and Havana Resident representatives cover the prin cipal commercial countries of the world

The Fairbanks Company maintains a staff of experienced buyers who give our customers the benefit of volume buying A force of 400 traveling salesmen, trained in mechanical lines, adds to the service

PURCHASING agents buy in two ways Orders may be scattered among many sources of supply, or the buyer may find all or a large part of his requirements met by The Pairbanks Company In centralizing his buying with The Fairbanks Comp uny the purchasing agent is in effect dealig with a Mechanical Supplies Department Store He orders all he needs from one holl and delivered nearly always in one shipment. Thus complications are taken out of buying bookkeeping and handling

Customers also turn to The Fairbanks Company because

- ( ) Here they fi d he best in M II Supplies Valves Scales Ingres and Pumps Traisn soon Machine Too's Irucks Wheelbarr wa and other me ha al supplies
- (2) They secure p mpt deliveries—insured by immense s o ks and motor truck service
- (3) They fid pre rgh
- (4) The purchaser ur her benefits by the thor oughly equipted Service Stations which are maintained nieurit if the Branch Houses

A call in person or by telephone at our nearest Branch House will pu you in touch with right hand service, which every Purchasing Department needs!

#### THE FAIRBANKS COMPANY

dm = a Off c

#### B on A Houses

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O eans Wah gui Haunu Cuha Indo Engad

FAIRBANKS
Company



\* TRUCKS & WHEELBARROWS \* ENGINES & PUMPS

**\* \*** 

#### Recently Patented Inventions

Brief Descriptions of Recently Patented Machanical and Electrical Devices, Tools, Farm Implements, Etc.

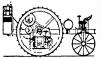
Pertaining to Appared

Shift! MARKER J. C. Kerrsees 1929 and white while effectively maintaining the compose 1 months on N. I the lefter fit in a matter property of the prope

#### Of Interest to Farmers

Of Interest to Farmers
IBACTOR S. A Income S. On Sodiyill
Ave. New Delware Ia. This Invention relates
to a fractor for drawns. For implements or
solid tow the general off-year are to provide a
sometration of machines we designed that a
farm Implement with it other load one, be
their distances in an income that the fractor
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TRACTOR R INTERSON ROSSIINI Alberta. an This invention has for its object to provide a tractor having a sirly; wheel within which a motor is disposed the fuel for the motor as well



as the motor controlling means, being led through as the motor controlling means noung led through the lules of the drive wheel. Another disject is to provide a radiator for cooling the water in the water jacket and having a fan whit is to rotate! by a turbling driven by the exhaust from the

SEPARATOR -- H R LINDSON ROY SA Sleepy Eye Minn. The object of the invention is to provide a device especially designed for separating wild peas from wheat and the like separating wild peas from wheat and the like wherein an endices moving aprun is provided arranged to its lined position upon with herain with the piece is poured another aprun being arranged in horizontal position for receiving the wheat while a director is arranged at the outsi dide of the last marred aprun for dispring peasa as they red down the tiest named apren

peas as the year down till tree mand a prom-HAY RAKI W. R. Bi reke Yoringtin New care of Anatopy Valley I and and Cattle Co. Its invention relates to has rakee that dump by a reviewing movement. An object is to provide a which red or riding rake in which the rake dumps by revolving movement and its manually controlled by the driver to position the rake for raking or for causing it to be dumped automatic ally also to effect the operation and control of the rake without gearing or complicated connections liable to get out of order

#### Of Concret Interest

DIRICTION INDICATOR C. L. Poor. 35
Thomas St. New York N. Y. This invention, relates is acidal and marine maxigation. Its object. relates to acidal an imarine maxigation its object is to previde a direction inductant more repectally designed to conside a maxigation to keep a research a spinal comes known as a nearch curve or on any portion of such rourse or upon an irrectular breakt a course composed of sections of such any spiral curve. Americar object is to automate ally correct the indication of the course of the vessel for the desiation of the compass on all points of

METHOD OF PREPARATION OF ARTI MURAKAMI 220 HORDWAY New York N Y An object of the Invention is the manufactore of artificial pearls and lewelry from crystalline leases of the record fishes or sea unbusts which are almost the same as senutic pearls and lewelry

courts with any smoke or extender short flavor.

BAITY of ARRIAMF ShAT. W H. Koerras,

"It hasherhocker Ave Brooklyn N Y. The
invention relates to state insents for budy outmixed to the state of the state of the state

adjustably comme led with the front of a carriage
without moderating the occupant of the carriage
in edges in the provides seat which may be conincred with any last of the carriage and supported partly its the bottom to present a proper
ampoors without full forming the carriage.

WINDOW CLEANING APPARATIR -- R B BRUGENER and L BERELMANN address L
Bernslmans 570 W 182d St. New York N Y
Among the objects which the invention has in Among the objects which the investion has in view are to essent the about no censuing windows to avoid the uncounty of the washer assuming a position matche in he window to provide means for removing the soil in the corners of the vindows, to provide means for automatically regulating the pressure on the window panels and to provide uncasts for rapidly securing the washing element to the apparatus

to the apparatus

RK I FTACTF — W Booker, 1141 Hascock 8.6 Brookly in N 3. This investor has been
granted two patents amone the pericipal obsert
art three inventions are to provide a receptable
art three inventions are to provide a receptable
strengthen the construction with relativelying
sections to prevent crushing to prevent leakage
and to simplify and riscores the construction
piles or laminations the outer ply being algeby
larger than the lame ply so that they may be
turned over to form a binding edge supplied with
an alliestin variating sittlicities cover see formed
nax he varied to form a coup bottle or ball-like
holy

NUT LOUK — 'D Swann Mogollon New Mexico Ihis invention has for its object to provide a nut lork especially adapted for time in rail joints wherein a plate is provided having



IDE VIEW OF A MAIL JOINT I ROVIDED WE

openings through which the bolts may pass and inving means in connection therewith for engag-ing all the nuts to prevent their being accidentally

Heating and Lighting OMBINED HOT WATER AND HOT-AIR COMBINED HOP WATER AND HOT-AIR HATER—A Subsants beching: Pe The havanton has for He object to provide a gas heatr wherein lame and outer cashing are pro-vided the finit rasing being a recapicals for containing water and being commerced with a mitable aware and every connected with a mitable aware and wherein the outer casing, which incluses the immer casing is an air heater

DRAFI OAGE R F Thoseson Dending New Masko. The invention has for its objecto provide a gage especially adapted for use with a furnice or other heater for indicating the pres-

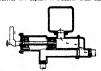


sure in the combustion chamber and in the stack to permit the fire to be regulated to given reading on the scale of the gage

Machines and Mechanical De-

quired to previde a construction and arrangement of as the parts whereby there will be successive stages of or any operation is ling done simultaneously the steps to has a or those of movement being evenly divided or times of miveament being ereatly divided for 'unither oligical' is to provided for 'unither oligical' is to provide for automatically (amplies shaping and riveling the brooms after the partie have been substantially properly arranged in pesition manually. A further object is an autometrient of partie whereby the morting slown; it will write of from a single power member.

AU IOMATIC BLOW-OFF DEVICE -F R DEXTER care of Hotel Caples, 350 Taylor St.
Portls at One The object of this invention is
to provide an attachment for a steam boiler



A VERTICAL MINGITUDINAL SECTION OF DEVI P

grit or other solid particles may be discharged grit or other solid particles may be discharge from writin the bolier to means operated anti-matically at any desired rate of speed by reason of the internal pressure as a result of certain adjus-ments ettler the whole contents or regulatable quantities may be discharged.

quantities may be dis harged.

It Bild GATOR: A. L. Marson. Granada.

Man. 18 invention has for its object to provide: 1 threated respecially adapted for use with
what mills for invertioning the parts thereof and
controlled by the movement of the vane into and
out of untative position to supply the intercent
income is also provided for indicating when the
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most of the shall received theory may be secured.

COMMUNED THRUE AND NEEDLE EX-TRACTING FORCEPS — W. L. GRAY Cham pakes III — the object of the invention is to provide forceps adapted for sugglest and wherein the forceps have means for grasping the times to draw it together and other means for clamping the modific to permit the same to be withdrawn the grasping means and the clamping means being simultaneously controlled

TWFE/FRS FOR SURGICAL OPERA-TION—IF I OWN NORTHCAL OPENA-TION—IF I OWN NORTHCAL OPENA-TION—SOUTH Africa. The invention relates to tweeze remove partil intelly designed for use in surface and the presence of the presence of the surface of the presence of the presence of the vacuum pink tyle to draw a ligament membrane or its life. On the tweezers to be gripped by the

#### Prime Movers and Their Ass

GAS AND AIR MIXING VALVE - D O Banur: 1021 Rive Ave Lima Ohio The inv mon relates to valvesfor internal combustion ended a for the two-stroke cycle type and has for it object the provision of an air saci gas mixing of it object the provision of an air sett gas mixing vall, while it all provide a properly proportional and theroughly mixed supply of air and gas during the vontinuous running of the engine the device may it builted directly to the engine bed or cylin-de and receive the air from the bed or any outside does not need to the mix the same with the prede-ter which quantity of gas the whind quantity of gas.

and to give part like color to the crystalion, by for its object to provide a bearing which may be provided as the substitution of the substitutio

# Ballverys and Their Assesseptis PRICE AND STATE OF THE ST

DESCRIPTION TO SERVICE THE SERVICE OF T go-rounds it has particular reference to a deve in or upon which a number of persons may be carried through any regular or serpentine pat having a pinvality of bumps or projections as over which base there is rotated a diskilice carrie around the center of the apparatus

VERICLE FWINER —C. LEMMAN, soddress VERICLE FWINER —C. LEMMAN, soddress Herman J. Culler. 1846 Fifth Ave., New York, N. Y. The object of the larestion is to provide a fender for automobiles street cars, and other volchies arranged to mormally clear ordinary obstacles in the readway and adapted to swine downwind into calching position on striking a person with a view to pick up and safely retain person and to automatically stop the vehicles.

SHOCK-ABSORBER—Address Inventor, Box 363 Galadem Ala The invention has for its object to provide mechanism capable of application to motor valides of every character for cushicular the upward movement of the ve-bicle with respect to the body and for cushioning



the recoil The shock absorber compri does wedge shaped plungers therein, expander blocks with which the plungers cooperate, springs normally forcing the plungers in a direction to

DOVEMENT AND A THE STATE OF THE

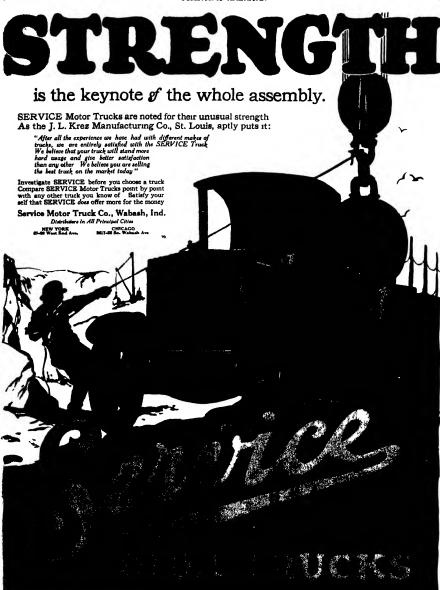
DESIGN FOR A LACE MEDALLION —L. Darivus, care of Hewitz and Rosses, 118 Roadway New York, N. Y. The inventor has been granted two patents one including the head of a soldier, the other the head of a soldier, the

We wish to call attention to the fact that we are in a position to render component services in every branch or plants or trade-mark work. Our staff is composed of methanical, electrical and chemical expert abromably minded to prisers the throughly minded to prisers the property of the complex nature of the embrechment of the complex nature of the embrechmenter involved or of the applications from the trade of the complex tables of the

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The Current Supplement

FIFRIBODY of normal vision must E often have reviewed in his mind the spe trum and wondered what in the world milit was doing in the list. In view of the indoubted fact that the average human bring sees nothing between the blue and the visit which can fairly rank as an independent color, nothing more marked vi let that corresponds to the transition between each pair of primary colors, the question is indeed a pertinent one. A highly reasonable answer to it, and to Newton manures will be found in SCIPATIFIC AMERICAN SUPPLEMENT for the und r the title Neuton and the Colors of th Spel n A point of some importance to the human races in general, is the Liussion of The Antanuty of the Tamil s<sub>1</sub> of 1 Ceylon and southern India. An arti 1 that will appeal to the nature lover is I art I grants giving an account of Comma with two very attractive photo-graphs. A somewhat kindred subject is us red in the Louise that Annoys Armie to red in the louse that Annoys Armies
throu and People at Home Much
validle data is compressed into small
upic in the Marine Diesel Oil Engine
A series of ittractive views including a When the street is the street of the street cause of the deposit from the atmosphere of some militans of tons of fine material over the northern and northeastern states within a few hours. How the Latent I mage or I hotographic Plates is Inteloped sets forth a new theory of the pracess, as irti le Radiun and Radio-Activity, is other short its ms of interest in various are of fields

#### The Biggest Car Dumper in the World

(Continued fr m swar 808) ti insfer their weight to the vertical part of It was necessary, therefore, to the crude It was nece cut the platform in two

cut the platform in two
the overturing of a hig leaded ear in a
modern American dumper is an interesting
thing mechanically. The platform and
cradic together with the ear, are to be
turned through an angle almost equal to
180 degrees. It is not proposed to let
anything also except the coal. Accordmally the arrangements will need to a
unit not though the car squaresty against its
trick with enough forces to hold car and
construction of the car and the construction of the construct are several steel construction concerns which build dumpers, so that naturally there will be variations in minor points In a representative case, the procedure will conform substantially to the following

platform in place, but not with sufficient force to prevent the overturn olamps and four ropes, distributed as suitable intervals along a cer, the vestigation provided takes care of the whole length of car. Naturally, as the loaded cepts overturned and in nonequence leans sieves and car Naturally, as the loaded very turned and in honsequence leans siere and more out of the dumper tower, the ropes keep them sternly to their duty. clamps and ropes interfere inappreciably with the discharge of the coal

The clamps the inselves are simple affairs There is the crossbar already mentioned On one end is a long rod set at right angles When the loaded car is riding and the clamps are in position, these rods will extend vertically downward and pass loosely through holes arranged in the floor of the cradle When the cradle returns with the empty car, the lower ends of these rods will encounter fixed rests The effect then is that the car goes on down and leaves the clamps standing in a row with their horizontal arms at a suitable distance above the car and extending well over its

As the loaded our goes up it meets the clamps and carries them along into position to receive the corresponding ropes when the overturn begins. The ropes lifting the cradic bring it up against a resistance which turns out to be in effect ropes continue their action, their pull is, by the pivots converted into an overturning movement

At Sewell's Point the deck of the pier grouper a grout clevation being necessary to provide on the and for the gravity discharge of coal from pockets or bunkers arranged beneath to the made it necessary to provide for getting the coal to the deck in some kind of rolling the coal to the deck in some kind of folling stock Spicial pier cars of 120 tons ca-pacity the largest cars of the kind in existence—are provided for the purpose They receive their loads from a dumper and then pass the two routes to the pier dick ()ne route leads up to a long incline deck. One rutte kads up to a long melne-to the pier dock and is accomplished with the aid of a byrney operated by cable. The second rutte leads to the foct of the eleva-tor framework. Here the loaded car passes to the alevator platform and is hearted vertically a distance of about 67 the pier deck tuder its own power and dilivers its load whi rever wanted. The second uper car is needed because it is get special pier car is needed because it is self cleaning the railroad car is not On the cleaning the railroad car is not to the pier, it is necessary to dump through the bottom. The road cars would fail here where at the dumper they do not fail because of their more nearly complete overturn

Of course, there is no such thing as perpetual motion in the sense that power ean be delivered without a correspo receipt of power from some source receipt of power from some source. How-wer, there is such a thing as the ad-vantageous distribution of power. At the foot of the elevator, the loaded puer car weighs, with its load, well over 400 000 pounds.

The platform and adjuncts used to raise

In a representative case, the procedure will conform substantially to the following account. The platform and adjuncts used to raise will conform substantially to the following and lower cars add considerably to this accomplished by means of such that the power plant is a substantially to the car and platform is also accomplished by means of raise in the platform is also accomplished by means of raise in the platform is also accomplished by means of raise in the platform is also accomplished by means of raise in the platform is also accomplished by means of raise in the power plant has less that a group of ropes will number, say, equalised, however, on the down-traptor unan ordinary but installation. At the power plant now has work to do, since well a Point, the big two-car dumper has a trip for the cach car. The rope relating car and platform do not come in all the overself of the counter weight four to each car. The rope relating car and platform do not come in all the overself of the counter weight has been proved in the car. A loose clamp is the time of the counter with the car. A loose clamp is but little difference between an upper suiterposed, consisting musty of a bar and a down-trip. The result is the perwinch structure and the power plant is not adjusted by the counter of the counter with the car. A loose clamp is but little difference between an upper suiterposed, consisting musty of a bar and a down-trip. The result is the perwinch structure and the power consumption is a bounded by the counter with the car. A loose clamp is but little difference between an upper suiterposed, consisting musty of a bar and a down-trip. The result is the perwinched that the power consumption is a but that difference between an upper suiterposed, the power consumption is but little difference between an upper suiterposed, the power constitution of the counter with the power constitution of th and lower cars add considerably to this

# PATENTS

YOU HAVE AN INVENTION which you want to patent you can write fully and freely to Munn & Oo for advice in regard to the best way of obtaining protection Please send sketches or a model of your in vention and a description of the device, explaining its operation

cevice, explaining its operation.
All communications are strictly confidential. Our vast practice, extending over a period of sevenity years, enables us in many cases to advise in regard to patentiability without any expense to the filont. Our Hand-Book on Patentia is sent free on request. This explains our methods, rms, etc., in regard to Patenta, rede Marin, Fereign Patenta, etc.

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#### LEGAL NOTICES | Signaling and Talking Through Space ued from page 871)

distance of 3,600 miles, and to Hoxelulu Hawaii, about 7 000 miles! A large battery of vacuum tubes, arranged as generators and others arranged as modulators, were employed in these long-distance tests. The vacuum tube in its present form is made in various designs, although funda-

mentally it consists of one or more filaments which can be heated to any degree and two or more electrodes. The theory of what takes place within the bulb is complicated hence must be avaded here for lack of space However the present vacuum tube is available as a dete tor of wireless signals and wireless telephone waves as a modu and wireless telephone waves as a moud lator or relay as an amplifier or builder of weak currents to powerful currents, and as a generator of alternating currents of a wide range of frequencies

# Electric Lampe Which Have Made Wireless Telephony Practical

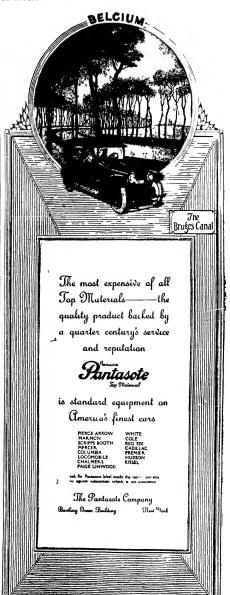
Given a perfect amplifier and a perfect includator, the problem of radio telephony is solved at least theoretically for all that is necessary is to modulate the output of an oscillating circuit and then if necessary amplify the modulate l current to any degree in order to obtain a sufficient volume of current in the serial for transmission through space Or one may first generate oscillations of large power and modulate them by means of the amphified output of the telephone transmitter. That is of the tecpnone transmitter rame is why with the perfected vacuum tube wireless telephony was practically per fected overnight. It became possible to telephone from simplanes to the ground and vice versa to telephone over land lines to a wireless station, which in turn sent out the conversation to a battleship or steamer, and to receive the answers back through the wireless station and land lines through the wireless station and land lines, and to telephone through space many thousands of miles Of course many details had to be solved. The noises of the arplane had to be contended with, by the devicipment of special ear process and helmots, as well as by special transmitters which would respond to the v-toe and not which would respond to the value and not to the extraneous sounds And with our Army and Navy in need of thousands of bulbs a week, the design and manufacturing methods had to be aftered so as to permit of quantity production
Like nothing else the vacuum bulb arrowed the greatest annels contributor to

proved the greatest single contributor to wireless communication Quite appro-priately it has been referred to as the modern Alladin s lamp

Thanks to the sensitiveness of the vacuum tube as a wireless wave detector, and then to its amplifying properties which make it possible to build the which make it possible to build the weakest currents up to any volume without distortion serials for receiving purposes have begun to shrink to amal proportions. This is that become possible to make use of exceptionally small serials and even burned serials. Indeed, James H. Ropers of Hysteville, Md., has developed as interesting form of underground wire-terms of the series of possible for submarines to receive wireless messages over great ranges without company up to the surface incidentally, this system, it is understood, practically climinates static—which is the free elec-tricity due to atmospheric conditions— as well as interference from undearable stations.

# Receiving Thousands of Miles with a Three foot Wire Loop

Another recent development in wirele Another recent development in wireless reception is the use of a simple loop serial, say three to six feet in diameter, with which it is possible to receive waves from which it is possible to receive waves from stations thousands of miles away, provided proper apparatus is employed. In fact, it is stated on good authority that within a year a loop serial will permit an amatetic to receive signals from almost all over the words. And the loop, most ramarkable of all, cas be used indoors. However, for

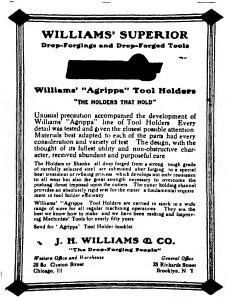




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BUILD NOW! Build the Bossert way

LOUIS BOSSERT & SONS, Inc., 1305 GrandSt., Breeklyn, N.Y.



emicut is as positioning in the proper plant s as to intercept the waves to the best add intig. The loop is employed on certain Arms and Navy plants for the purps is a considerable for the pilot by manerity sing albut until he receives the loudest signals from a ground station to locate it direction of the station. The loop n that ease is generally incor-

How the I mied States Government kept m tou | with our forces and diplomate oversus is one of the most interesting storics of insiders radio communication Indeed early in the war information was received their the Germans were making received that the Germans were making of the eathers or perations for the entiring of the cables for the purpose of interrupting our communication with Lurope and this fact in or than any other gave a tremendous min tusto wireless. As it was three cables are a superior of the cables were actually interrupted, and excapies were actually interrupted, and ex-cellent evidence is at hand that enemy in-fluences were responsible. Wireless tele-graphy was called upon to assume only part of the burden of cable traffic, which often aggregated 200 000 words in each direction per day and at no time was the radic service worked to full capacity

It is from a little room in the new Navy Building at Washington, D. C., that all our trans Atlantic radio traffic is handled The Naty operates four powerful stations
—Annapolis Md New Brunswick N J,
Sayvilli I and Tuckerton, N J
The Annapolis station, with its four
Gol-fout I we is a believed to be the most
powerful station in the world It has powerful station in the world It line a 350 kilowatt transmitter The New Brunswink luckerton, and Sayville stations are rated at 200 kilowatts each, tions are rated at 200 kilowatts each, All these stations are operated from Wash-ington by means of land lines. Whereas other governments operate their wireless

other governments operate their wireless stations at the very base of the lofty puwers we have gone a step ahead of them by centralising our stations in our Capital. There are four tables in the trained one of the four stations. On each table their are two ordinary telegraph keys, one of which is directly connected by heavy land cable with the transmitter at its respective station. The operator, sitting at Washington operator in the transmitter gat Washington operator in the transmitter without the vivies of another operator. The other key serves to telegraph any instructions as to the manupulation of the structions as to the manipulation of the transmitting equipment

# Operating a Wireless Station from a Distant Point

Lach operator wears a pair of telephone receivers which enables him to hear the signals from the transmitting station which signals from the transmitting station which he is operating. The receiving aerial is errited on the roof of the Navy Building at Washington carefully attuned to the wireless stations to which it belongs. One table operates the New Brunswick station, whi h may be working with the steamer Grorge Washington The second operates the Annapolis station, which may be working with Lyons, in France Ordinarily the New Brunswick station also the Managhoi station, which may be be the groun and shalls in which such great the Annapolis station, which may be be the groun and shalls in which such great the New Brunsweit station that the New Brunsweit station that the Managhoi station of the Station on the Station of Station Station of the Station on the Station on the Station of the Station Sta opp the with Lyons, mauring two traffic lines instead of one. The third table operate Sayville, which may be working with the station on top of Admiral Sines a office in London. Incherton is operated from the fourth table, and may be used for keeping in touch with Rome or other Luropean capitals and centers Most working at once, yet there is no inter-ference because of the perfect syntony or tune of the transmitters and receivers

acruais a c not going to disappear so soon, in annipulating a keyboard. The paper because 1 is mostly the reception of inectape, in turn, can be resided through a sages which items it said to burned acruais and I spis. What makes the loop as 100 words per munite, as compared with effects it is it posttoming in the proper the usual 28 words a minute of hand aloo words per munte, as compared with the usual 25 words a minute of hand winding At the receiving end, aspecial photographic form of recorder, which comploys the string galvanometer and a beam of light principle, records the high spend messages on a tape which can be decoded in the operators own good time

It has been said of aviation that the war gave it at least a 10-year gain in develop-ment and application But in this respect aviation is not unique, for, to all app ances, American radio communication has made an equal advance as a result of serving its country and the Allied cause

#### Admiral Sims in the Team-Work for Victory

(Cuntinued from page 874)

As to our forces serving under foreign commands, one has but to stop and think of the tables reversed, with foreign navies of the tables reversed, with foreign navies coming over to operate from our ports, and with our Navy from our shores and imagine our Navy relatively higger than the other navies, as our s was relatively smaller in this war. Wherever our ships were allorated they found already existing a large number of ships with large bases and supply systems and complicated extensives. and expansive communication system

It would have been nothing but ridiou-lous to have insisted upon any of our officers relieving the senior foreign officers in command of these stations from which our ships were to operate, commanders who had been carrying on their duties for three previous years of the war As a matter of fact, Admiral Sims never questioned as to who was to command, that is, whether a foreigner or an American, he merely assumed that the senior man on the spot who should naturally, owing to experience be the best man, would, of course, command our ships when they joined his ships

#### **British Munitions**

(Continued from page 375)

1918, there were 198 of these operated by the Ministry of Munitions — First were the four Royal Factories, engaged in producing four Royal Factories, engaged in producing ordnance, guspowder small arms and air-craft Then there were 46 explosive and propellant factories, 22 filling factories where women a hands filled shells to shoot Huns 13 projectile factories, 40 shell Huns 13 projectile factories, 40 shell factories, nine ammunition component factories, neven tool and gage factories, 28 hox factories and saw mills, eight air-oraft factories, four steel works and rolling mills, 10 ordnance factories, three small arms ammunition factories and four missedlaneous factories

These plants, many of them starting small, often grew to tremendous propor-tions In the great arsenal at Woolwich tions In the great arsenal at Woolwich a rapid growth took place, typical of all. To it, England is indebted for almost all kinds of munitions and for the performance of work of the most highly-specialised and of work of the most nighty-specialized and skilled character including the preparation of drawings, specifications and the work-ing out of the details of the new types of both guns and shells in which such great

or tum of the transmitters and receiver [actor, in the decision to establish and in order to speed up traffic, especially logicate a Ministry of Munitions factory, in the case of press despetches and similar As an example of economy, a group of volumenous matter, the radio messages TAT factories within have been operating are sent by means of perforated paper for the longest period required a explicit aper An operator, sutting before a machine which recembles nothing so much as a capacity which has already psedioced extraording to the contract a paper trap by!

# Pierce-Arrows ready now for peace needs

THE needs of war required no change in the design of Pierce-Arrow trucks. The same models that solved transportation problems in 148 different lines of business before the war solved also the more difficult problems of war transportation.

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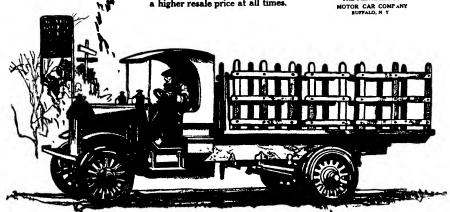
high speed production and carry your product to waiting markets.

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Loses less time on the job and off the job;
Costs less to operate and less to maintain;
Lasts longer, depreciates less and commands
a higher resale price at all times.









#### British Munitions (Continued from page 224)

ploaves at a cost of \$17,500,000 which, at the ontract prices being paid when the factory was under construction would have at I ngland \$35,000,000

The cost of production of TNT at Queensferry in 1917 exclusive of interest and am ritration was about 17 cents per pound. The cost in the market when this fact 1y was started was about 43 cents per poind

Because the war is not yet ended, the Ministry of Munitions is giving out few if any figures on the amounts of anything suppli | But percentages are of little use t the cancing and they are available to use i in Cours and they are available to some (\cappa if for instance the production of mirjims by the end of the war had grown to over 700 per cent of what it was at the beginning Arplane factories turied at in a week at the time of the armist o more planes than the whole country produced in the entire year of 1914 in a 1 nth more planes than the ontire produ it n of 1915 and in three months more planes than the entire production of 1916

In meline-gun industry increased by 3 700 ; r cent Eighteen pound shells wer tiried out to the tune of 900 per cent

wer timed out to the fune of 900 per cent at it trunslere against one per cent in August 1911 and so the sterv runs.

In to the warfart supply department han it is unorm use variety of supplies from funes also helmets shelds specialized chemical apparatus (ronch under the period of specialize to common apparatus continuor tus and their ammunition. This depir is it is ipplied 1 500 000 steel helmets is one period of six months. In De cult r 1316 the tennage requirements. amounted t 7 648 tons, while in June 1917 they reached 17 963 tons

1017 the reached 17 903 tons
In March 1017, the high explosive output was four times greater than in March
1015 During the war the optical output
of Ingland which country had previously
depend of as had we, largely upon German, for glass and mathematical instruing its light increased by 2 000 per cent

It has all been done at a tremendous The national munitions factories cos-Cerants of more than \$80,000 000 have been made to private firms besides a similar sum in buildings, tools, plants etc., handed over to private firms by the Ministry, that they might work the faster and the better National arsenals increased from three to more than 200 -of what use to continue isolated figures? Fingland jumped into the war with both feet and when she set her self to make her armes the best equipped and the mast efficiently provided in the field she did it whole heartedly, single-heartedly absolutely regardless of any other con-uderation. We in the United States are proud to think of what we did in a year, but sending two million men abroad from a population of 110 000,000, big feat as it is does not bulk so large against putting an arm; of 7 000,000 in the field from a population of 40 or 50 million and in addition to supplying them supplying allies including United States troops, with much of what they fired and much of what they fired from

This may not be the place to speak of the women's part in munitions work—it properly belongs, doubtless, in a story on labor but it should never be forgotten that at the time the armistice was signed nine-lenths of the total shell output was the work of women who prior to the war never even saw a belt, a lathe, a tool or wore on ralls

It is with some timidity that the matter It is with some timulity that the matter of labor statustics in munitons work are approached. They differ so—they so contradit cash other! One department says roundly that three million people are employed in making munitions. Another says it is two millions. Both are probably right, the larger figure including all civilian workers on war work, the smaller referring in



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New York, N. Y.

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only to those supplies governmentally classed as munitions, and perhaps excluding Admiralty laborers. However there is one set of figures which comes iresh from the Ministry of Ministers which ought to be authentic, and which because it illustrates so wonderfully the growth of the trates so wonderfully the growth of the munitions industry, one is kimpted to give in full and in tubular form. Only no one reads tables of figures, so the table is comutted and the attempt made here to force the reads; to absorb the story the numbers tell by as it were sneaking them past his vigilancel

In the beginning of the second quarter of the year 1915 which means of course six months after war was declared, the government here had employed in both governmental and private establishments in the metal, chemical, explosives and rubber trades but not including the Ad muralty workers, not quite 600 000 people marsty workers, not quite 600 000 people in about the proportions of eight men to one woman. In sax months more, or by feetber, 1915 the total was 1,003,000 but the women had almost doubled in numbers. By the end of the following year there wer. 16-4,000 of these maintions workers, of which 818,000 were women more than six times as many as were at work 18 months previously And on October 1st 1918 just before the armsitie supplies were turned out by 2 049 000 munitions worlds of which more than a third were women 1 419,000 men and 730 000 women Plane note carefully that there me not figures of either women or men corders workers in England but exclusive of the thousands on trains, tram farms and in civilian factories. The Ministry of Munitions confesses to have no very exact figures for 1914, but estimates that before the war al out 50 000 men and practically no women thid munitions work Great Britain will not be entirely without

material reward No one here thinks any sacrifice has been too great any bard ship worth mentioning any dislocation of tradition too severe to undergo, now that Germany has been definitely brought to her knees and the war won. One hears no complaint no monning no expression of regret that the right little island has been turned wrongside out and upside down socially politically and upside flown socially politically economically to get on with the war to carry on to the successful accomplish night but when at last the war disloca-tion is rest, England may well look to some of the fruits of her munitions work with a feeling that at least there is no great loss without some compensatory small gain. For metance, as a direct result of munitions campaign. Great Britain can now claim first place in the electrical in dustry, over Germany and Austria she can do on many accounts, but on none she can no on many accounts, but on non-more than on the production of man India produces 50 per cent, (anada 15 per cent and what was German 1 as Africa 10 per cent of the world's supply And now Indian mita can be exported

from that country only to London! England now produces all the high speed tungsten steel she needs In pre-war days the Critical Emigroum produced no ferrochrome, needed for certain steels Now one factory, driven he waste gas from coke ovens in a quite American-utilization-of-waste-product manner, produces enough to meet all the requirements of the kingdom. In pre-war days the United Kingdom used some 240,000 tons of spelter annually, of which 77 per cent was imported from Germany, Belgium and Holland The Australian concentrates are now, of course diverted from Germany to the United Lingdom, with the result that the sinc smelters are trebling in sise Prior to 1914, 30,000 tons of potash were Prior to 1914, 30,000 tons of potsals were imported annually, principally from the Stassfurt mines. But England discovered she had 50,000 tons going to waste in dust and fumes from blast furnaces, and hearly 20,000 tons annually are now being re-covered and there is more on the way. England has learned a great many things



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y cost no more in San Francisco than they do in New! Stanging the price on every pair of shoes as a protection against high prices and mrasonable profits is only one example of the constant endeavor of W.L.Doughas to protect. Its customers. The quality of W.L. Doughas product is guaranteed by more than 40 years experience in making fine abose. The smart styles are the leaders in the fashion centers of America. They are made in a well-equipped factory at Brockton, Mass., by the highest pard, stilled shoemakers under the direction and supervision of experienced mea, all working with an honest determination to make the best abose for the price that money can buy.

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#### WASHINGTON. HOTEL DEWEY

N order to meet after-war conditions the DEWEY HOTEL, situated in that exclusive residential section, at 14th and L Streets (5 minutes In that exclusive is sidential section, at 14th and L Streets (5 minutes walk from the White House), has opened its doors to transont guests, which is the property of the Capital Processing and those prominent in official life of the Capital. The accommodations are limited, and only those whose presence will be compatible with its clientele will be accepted. It will be best to make its exervations by letter R with the first processing and the processing of the processing and the processing of the processing and the proce

FRANK P FENWICK

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about factory work she never knew, or if she knew, would not use, before The mechanical conveyor, the electric truck and trailer, the shop sled, the standardised output the health and condition inspection for workers, are cases in point—not that she did not know of them in pre-war days but that they were not universalas they now are

One feels totally inadequate to under-stand, let alone describe, a munition program which has been as immense at home as the armies in the field which demanded it have been immense abroad But one looks at a figure here, a picture there, a worker in overalls trundling a truck of shells who should be trundling a babyone sees old men, crippled men, men in ill health all with a smile, making shells and guns one sees workmen to whom the church in veneration, working hours the cauren in veneration, working nours the trade minim never sanctioned, side by side with lilates" and girls and doing it willingly to get on with the war"—one sees long factories built where were fields and puks and waste spaces, enormous structed almost overnight, and one sweeps one s hat from one s head in hearty admirate n and a little awe—even if he comes from a country where such things are commonly done as a part of the romance of industry at the spirit, the courage and the single minde ness which 'carried on such a successful and such a magnificent

#### Substitutes for Belting in Germany

I ACK of leather for driving-belts and of oil for lubrication caused the Girmans to invent curious substitutes, according to the War Frade Intelligence Department of (nest Britain, which has been investi, iting the enemy's secrets Belts were found that had been made of paper tissue or hur varn

If very strong yarn was used in chainstitch only one layer was required, whereas weaker yarn had to be twisted together in severd layers It was advisable to edge the belt with leather or tin, otherwise the

edges were away rapidly
Driving belts made of tissues sewed together or colled inside one another were together or tolled made one another were executingly restant and stronger in the edges. The friction was slight and they could in mended easily. This kind was made modelly of spun flax, hemp, or paper yarn. Those of the last kind, which were plainted on kinted, had no transversal threads which serve to make the edges extensive. atrong

Cellulose material was used for medium sized muhinery, but care had to be taken in putting them on, and not to pull them too tight for they could not resist much The varn belts were also woven or knitted in tube form which was flattened out afterward and sewed together, cotton or pup: was used mostly in such cases They proved very useful substitutes for leather

The Lextilose-Enata belts consisted of equiately twisted jute or cotton threads They proved to have great flexibility and clasticity, each fiber bore a part of the tension and there was no giving away at

The former rubber and balata bolts have given place to ones of substitute rubber. The newer material proved to resist melting when heat was caused by fraction | I be main drawback was that it could not stand much tension

could not atand much tenson
At the Lenpuc exhibition a new belt was
shown comprising the following. The chain
made of horse-hair or wire, the cross
thread of idd cotton, typha, or peat filter,
the belt so formed being thickened with
tar | hose driving belts were only supplied tail in exchange for a form testifying to the need of them

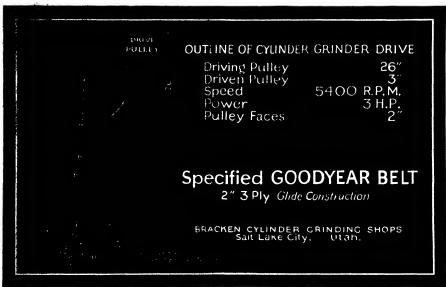
to the need of them.
In a wood weaving works, it was reported,
the thick canvas driving belts, which
substituted leather ones, had been found
satisfactory since they did not suffer any
more breakages than leather. However,
they could not be renaired so often.

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MORAL MARKIG. Including Schehhop Practice, Design and Canattypalism of Models. Edited by Raymond Spinner and Models. Edited by Raymond Spinner Acts. Edited by Raymond Spinne of and that will be new to most workers In metal? The directions and drawings are complete to the finest detail and there are help and inspiration at the turning of every page. The first part off the volume will be a revelation to the insepara-sized. It deplots the ideal workshop, shows how the man of limited resources may hentail it in the collect or the state and treat of its lightling, best-cular or the state and treat of its lightling, bestcalls or the actio and treats of its lighting, bead ing vestiblation power-drive machinery, each tool equipment is furilliarises the student with labbes and laber book, first land drilling, soft and lard soldering hardening and temperior, and the use of abreatives. How many mechanism can make their own patterns? The chapter or pattern making is a complete treation in itself. balls in their own patients. The shaper on pattern making it as complete treating it itself, while that on electro-plating describes a process of the present injurcations to the present injurcation to the present pattern and appearance of the flatbod work and one that is by no means are onesty for introduce as is unably to instance and onesty for introduce as is unably to instance and onesty for introduce as is unably to instance and onesty to introduce as in the pattern of the pat a cantal inspection was reset up for it a root friends, and among the few choice volumes upo which the earmest creftment depends for unfaith said and impiration it will soon make itself indi-pensable

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Van der Veer, U. S. N. New York:
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907 pp. illustrated Free, S. 128.
New to its stith edition, this excellent immunistive control to be nowledge that reducil to a table
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inself to every man aboact ship, Part II to estimate
of seasons branch. Part II to dide! postry officers,
and Part V to men of speeds reducing its state of the control form and part of the control form and part of the control form of the control of th



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# High Speed Grinding—and the G.T.M.

Henry L. Bracken in Salt Lake City used to have what he called a champion belt eater. It was a high-speed cylinder grinder with an old style drive. It cost a hundred dollars a year to keep that one little machine belted. The highest priced belts lasted only six or seven weeks—some only two weeks. As soon as their joints went bad, the belts were practically done; for the mile-a-minute speed of that drive and the reverse over an idler, made durable repairs almost impossible. Occasionally the joints did hold and those were the times when six or seven weeks' service was obtained.

One day our Mr. Le Masters, a G. T. M.—Goodyear Technical Man—called and explained to Mr. Bracken the Goodyear idea of selling belts to meet conditions and not as a hardware man sells nails. He explained the Goodyear Plan of accurate diagnosis of all drive conditions before prescribing the proper Goodyear Belt. Mr. Bracken listened, felt he couldn't possibly do any worse than be was doing, and took Mr. Le Masters to his belt-devouring cylinder grinder.

The G. T. M. studied the drive, measured the pulleys, measured the speed—and then studied the pulley faces carefully. He found that they were the kind that Glide Belting is especially designed to serve—so all that remained of his problem was the length, the width and the number

of plies. He prescribed these to fit the conditions and Mr. Bracken signed the order for a Goodyear Glide Belt, costing much less than the kind he had been using. The belt came and, of course, didn't have to wait long. It was installed November 18th. It has outlasted every other belt and at the time this advertisement goes to press, it is still running

The G. T.M.'s service and Goodyear Belting have done more than cut belting costs. The grinder runs more quietly, does better work, is much easier on bearings, and according to Mr. Bracken is like a different machine. He has since had the proper Goodyear Belts installed on all grinding spindles.

If you have a belt-devouring drive that is eating too many dollars, ask a C. T. M. to call. He'll do it without charge when next he is in your vicinity. There are many of them—all trained in the Goodyear Technical School—all with experience in plants similar to yours—all selling belts to meet conditions and not as a grocer sells sugar. The C. T. M.'s services are free simply because the savings they effect for purchasers are so considerable that a gratifying volume of business from the plants served is certain to come to us within a few years.

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO





The man who owns a GMC Motor Truck may well look upon it with the same degree of confidence he once placed in its predecessor the horse his faithful friend

Whether it be a single GMC Truck or a fleet the owner finds untold satisfaction in his confidence that his work will be well done

During the years since GMC Trucks were put on the market there has grown up among GMC owners everywhere just such a feeling

Trucks from the very first were built to be inherently good Good for their own sake

No GMC Truck was ever built to meet a price

The GMC ideal has been to build the best truck possible in a particular size, for a particular kind of work

That is why, as a result of proof of performance the reputation of GMC Trucks for rehability and plain honest quality is rapidly growing





# SCIENTIFIC AMERICAN





#### IDEALS can be transformed into service

- and service - performance - is what you want and must have when you buy a motor truck

The DIAMOND T MOTOR CAR COMPANY a little over a decade ago began in the mind of the president of the Company, with little money and a big ideal

It is now one of the largest plants in the country devoted exclusively to making motor trucks

# DIAMOND T THE NATION'S FREIGHT CAR

The original "little money is now a great deal of money,

—and the present ideal is the very same ideal that the Company began with

The original ideal was (and is) this to build a motor truck that will give a service equal to, or better than the best

—and to keep down the production cost and the selling price, by eliminating expensive non-essentials and un-

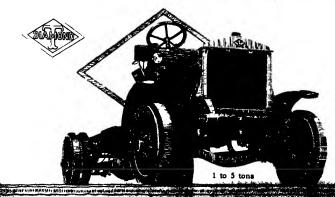
certain experiments

That ideal is realized in the DIAMOND T

Put this statement to the actual test of careful investigation

Write us about your trucking problems—we can help you, as we have helped others

DIAMOND T MOTOR CAR COMPANY, 4521 West 26th Street, CHICAGO, ILLINOIS



# Selden





1877 1919
The first geroline moser proposited road megan uses a SMLDBN The present types of SELDEN TRUCKS one the ramit of years of contamous experience, observation and experience in manufactures mose the day of their inception in 1877

Among the numerous users of SELDEN TRUCKS are many of the largest and oldest established business organizations in America.

GILLETTE SAFETY RAZOR CO.

**BOSTON** 

for instance

One to Five Ton Worm Drive Models Write for full information

SELDEN TRUCK SALES COMPANY ROCHESTER, N. Y., U. S. A.

Trucks

# It picks your pocket while you took on!

The last pre-war figures show America's fire loss at the astounding figure of \$2.10 per person per year. This is what you and everyone else in America paid to fire in 1913—four times as much as the Frenchman paid, seven times more than the Englishman and far more than in any other country investigated.

If this tax you pay to fire earned you immunity from it, perhaps the cost would be justified.

But fire grants no such stay—its threat is omni-present. Conflagrations still rage particularly in America where its toll is greatest.

We have built our towns in a hurry and in the haste have overlooked the fact that "fireprocided" to have proper emphasis should be read "firep-rocfed." For the easy path for fire through a community is across that community's roofs. Not always are roofs the kindling point but invariably they mark its course—unless they are built to repel fire.

In Johns-Manville Asbestos Roofing lies the answer to both community and personal fire safety. For in this fire-safe roofing, adaptable alike to factory or home, warehouse or public building, is nature's rock-like fibre, Asbestos—that repels fire, limits its destruction and protects your property.

It is of first and vital importance that you protect your own property against fire loss because this self-protection when taken collectively means the fire safety of America.

There is a Johns-Manville Asbestos Roofing on this list that on your building will protect you from fire's scourge.

Johns-Manville Asbestos Roofings: Asbestos Built-Up Roofing; Asbestos Ready Roofing; Corrugated Asbestos Roofing; Colorblande Shingles; Transite Asbestos Shingles.

H. W. JOHNS-MANVILLE CO. New York City 10 Factories - Branches in 63 Large Cities Through —
Asbestos
and its allied products

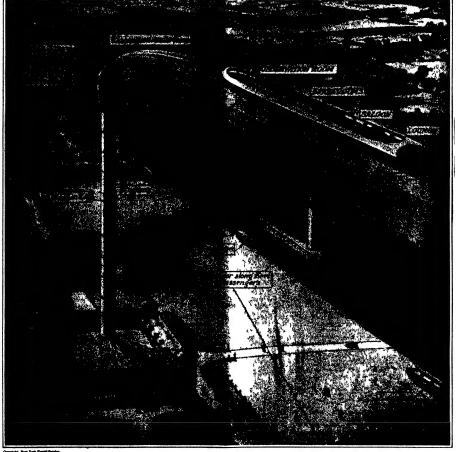
INSULATION
the heat where
CEMENTS

JOHNS THE PACKING 
## THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX |

NEW YORK APRIL 19 1919

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nge trans-Atlantic rigid dirigibles, showing the salient features of the landing station and the airship —(See page 400)

## SCIENTIFIC AMERICAN

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# New York, Saturday, April 19 1919 Munn & Co 233 Breadway New York

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H Dude the 1º / of Represental Engineering Cornell United Bary 81 H w r f r f of Anguse Currope Past of Technical Past Service Cornell 
#### How Big Is Our Merchant Fleet?

Till country is following with dcp interast the upbuilding of the United States Merchant Marine If it is not it should be for there is no great industrial effort of the day that compares with this either in the present insignified or its future, possibilities. The absence of our mechant flag from the high scan has been a source of amazement to the American traveler for many a dread; past and a cause for deep concern to the shapping men of the country. For the prosession of a great merchant feet is something, mare than a valuable commercial asset it is a source of proper particule prind: as a vasible expression on all the seven seas of the enterprise wealth and power of the country whose flag; till liss

whose flag; tilines
So the awakened interest of America in its merchant
marine is in sit fortunat; and should be stimulated by
werry proper means. Infortunatly the way things are
going it is impossible for the average citizen to under
stand just what progress we are inaking relatively to the
other ship-owning nations. This bewilderment is due
to the fact that the Shipping board talks of its ionnange
one language and the rest of the martinen world in
another and as it so happens the difference is such as
to lead the American public to believe that our flect
is 50 per cent larger than it is in comparison with those
of other nations.

The Shipping Board speaks of its ships in disabugations whereas the whole martime, world always has and does now speak in terms of gross tons. Now a gross it in a shout fifty per cent larger than a deadways to a most final manufacture of the shipping Board nomendature means dendwight tons and a subtract in of one-thrid he inside it comparing our total tonings with that of the rest of the world we shall have a greatly exaggerated at day of his to being accomplished.

Thus if we are told that our total tomage deadweight, is 9 200 000 tons and then find in some shipping journal that the world's total is 17 000 000 tins we shall jump it the false cont insome that we own one-fourth of the wild shipping. We matter of fact we only for the wild shipping. We matter of fact we own but consent the 47 million tone of world shipping being expressed in gross time is equal to ever 55 million tone deadwight.

The as if the term deadweight is due to the fact that the Stape  $\lambda$  B  $\lambda$  I made its centrates in deadweight tons (as if in left  $\lambda$  I) is the set if large shaped and it was in if  $\lambda$  in all it them to make it as monorement of what it was gives  $\lambda$  in only the returns. Loosably the Board all  $\lambda$  I it is pression in melature somewhat for the effect the large  $\lambda$  it does not be now to worst it passes on this in shape come the Board will surely all  $\gamma$  the terms which are in universal most throughout the norminary will be the order.

#### The Advent of Colloidal Fuel

HAT are we going to do when our oil walls with marty? And dry they certainly will run in the near future unless our geologate are activities. We have used up 40 per cent of our native supply of petroleum, a waves iranklin K. Lans, reservatary of the laterior Between 1850 when petroleum was first discovered in Prinasjivania, and 1917 we drive from our undarge und reservoirs a total of 100 000 000. Today there are left in reserve for each of an a more matter of 70 barris. It proposed is disquienting because we are draming Nature's supply with uncreasing volume each added tax live month.

I or our newly-created merch at a marine we shall need about 32 000 000 barries of foul it in the ansuing year and our fighting fleet will consume in that time a round 4 000 000 barries. These are merely straws which show the trend of the current of community in Quiet half of all the petroleum mined in the country is used for steam rassing and these are parts if the United States today wholly dependent upon liquid fuel. Crude oil and petroleum derivatives are independable to our industrial progress and to our many other manifold activation.

In sentistic are no less insustent that anthractic coal as luxury and that Nature has needs it dutressingly pain that that fuel will cease to be available here in the next forty or fifty years. Be this so it may it is included the next forty or fifty years. Be this so it may it is included the next forty of fifty years and the next forty of the next fo

Happly for us, the Submann Difease Association, largely through the investigation of its empineer Mr. Lindon W. Bates, has answered this momentous quistion. Thanks to their combined efforts during the war to produce a smokeless fuel and to safequard our Allies from a shortage of vitally necessary fuel oil they have voived a combination of oil and pulversate coal etc, which is termed collidad fuel. This source of energy can be fed to the burners of any existing oil-burning equipment and does not call for change of installation of any sort. In just that measure in which powdered coal, tar ground cole etc. is added to each gallon of the liquid fuel a like quantity of oil and supensed with and yet the total value in heat units is actually augmented.

To make the practicable many months of laboratory research were required to discover a medium which would neutralise gravitation and keep the introduced heavier particles of carbon from setting and calling for some special apparatus to str up the insture just before drawing it from the tanks for burning. The new agent is a paste-like greasy substance called firsteur. Twenty pounds of this stuff in a ton of liquid fuel keeps the powdered coal and tar suppended in the oil and evenly distributed throughout its volume.

As a result of this seeming annulment of one of Nature a laws it is possible to combine in a stable lough fuel 45 deper cant of oil, 20 per cent of the and 55 per cent of oil, pulverned cost, thereby replusing over one-ball of the hold oil as curing equal or greater host values per barrel and oil as curing equal or greater host values per barrel and fuel can be prepared which, upon a given tank capacity, and ligwe warnhips or merchant vessels a 20 per cent of merchand steaming radius neer that possible with the usual fuel will all the fuel passive am mobile to sustained and easily applied pressure and may be thus pumped fed and it sumed in the cost in ston changed.

the achievement makes it puntitable to commingle the waste products of the mint the gas-house, and the oil rebnery and thus to cut d sin to a large extent the present consumption of fact and a sone result of our fifort to neutralise the gram activities of Teuton U-boats, we now have offered us a potential economic boon of coormous value.

#### Science and Utility

HE ancient Greek took what solence he possessed he as a mental recreation altogether. He pursued he geometry, not with any idea that it was or could be made of practical use, but solely because it in appealed to he in stellect. Indeed, he went further than thus, he actually frowned upon its practical use, and in the rare event that such profanation became a practical measurement that such profanation became a practical monosity, he placed it in the hands of his slaves, so that at least he own much might not be degrated by the shameful contact between the beautiful world of thoughts and the commonplace uply world of things

Today we soom universally inclined to push to the other extreme. Nothing is worth doing on its own grounds without consideration of its practical bearing. Leven physical oxercise, in which we includes with as enthusiasm duplicating if not actually exceeding that of the Greek himself is apologued for as a means to the altogether practice of keeping us in physical condition to do more work and batter work in our weeking hours. As for mental excress or mental recreation

—this to the utter durany of the classicants, as a lost art. Most of use do not attempt it at all. Some of us pre-tend to partake of it but turn such parteipstion into a commercial side-line—a means to make spare time pay cash dividends under the more or less plausible pleas that the change of work affortis an enjoyable relaxation from our regular occupation. And those of us who really do pursue a mental recreation without hope of manual advantage bring to it the same misensity that characterizes our real vocations so that the professional sologust or conchologat or some-other-time-of-same ologists counts himself fortunate indeed if he can keep up with the amatteru who follows the line only as a kobby with the amatteru who follows the line only as a kobby

We do not know whether all this is to be counted as an advantage or as a disadvantage in casting up the account for and against the modern viewpoint as to what is and what is not worth doing Certainly there are advantages, even if this be not among them. In particular, there is the paramount advantage for which we are really striving more or less consciously that what we do really gets done with more effectiveness than it otherwise would The Greek intellectually was our equal-perhaps even our master Yet he never set up a civilisation that amounted to saything in any other direction than the artistic, simply because he never could be induced to bring to bear upon each other the facts of everyday life and the things which he knew or thought he knew is in our ability to work out this correlation that we may find the key to modern progress. And it is clear that to our insistence that all things pay their way we can directly trace the current partnership between the man who knows and the man who does

This insistence can be seen on every hand The mercest school child claims the privilege of deciding, on strictly utilitarian grounds, what shall be taught him, of reporting or at least ignoring every sgrap of schooling whose utility cannot be demonstrated. The decision between French and Germans and Spanish hingse on the tweese French and Germans and Spanish hingse on the tweese French and Germans and Spanish hingse on the tweese of college vs. business as adjudicated on a hard The case of college vs. business as adjudicated on a hard the season of the sea

The answer to this question is always pertinent, and usually interesting Its pertinence and its insteasi increase with the appearul complexity of the subject, and the appearunt improbability of its ever attaiging, a basis of practical use. As a case up point, we may believe attention in this work is SPECHARINTO on Uniter-relate energy and its commercial application. The strikes, of using nutrients belief in his brefines will intrigue the laymnam much in the same manner as did the same notion with regard to X-rays and nursies warner.

#### To Our Subscribers

OUR subscribers are requested to note the expiration date on copies of Sciences American If they will send in their renewal orders at least two weeks prior to the date of expiration, it will aid us greatly in rendering them efficient sorvices

#### Aeronautical

Air Service Canuarities in A. E. F.—The War pepartment has recently amounced that during the serial sighting at the front, the American Air Service suffered 854 casualizes as follows Killed in action, 171 pracestes, 125, wounded 129, missing, 73, killed in accidents, 43, muscallaneous 4 The number killed in actions in over a third of the canualizes During the month of September 181 casualizes were reportable.

Government Sales of Flance and bquipment— The War Department authorises the following statement from the Office of the Director of Sales Sales reported to the office from March 8th to March 14th, inclusive, include the following Air Service equipment. Airplance, 3319,000, airplance equipment, 8078,887. These figures are interesting in view of the vast amount of aeral equipment which the Government has for sale in the process of reduring the Air Service to a peace hass All masterials sold by the Director of Sales aggregated 42,499,827 within the time covered by the foregoing

London-Cape-Town Air Flight — During the next few months the Britash art Munistry propose an experimental fight from London to Cape I own bxploration parties are out on the road brong upon stope and petrol estations, which as far as can be arranged will be about 600 miles apart. The route sket tod will probably be London, Paris, Marseilles Naples Croic, Egypt Nile Valley, Northern Rhodens, Vetoria I alla Johannesburg and Gape Town, a distanct of some 7800 miles It is expected that a Handley-Page machine similar to that which carried General Salmond from Egypt to India will be used.

Flares for the Trans-Atlantic Pilers—Ilame and senoire farse developed during the war and improved recently by chimical experts of the army will be employed in the coming trans-Atlantic fight effort of our naval armen. It is understood that our armen will drop three first as it interests, so as to determine the drift of their planes in the cross winds and to make the corrections necessary to keep them on their course. The flares are so constructed that they ignate upon touching the water. By day they may be seen by means of the column of smoks, while at night they can be detected by their bright flare.

Our Air Service for Peace — According to the latest available information, it is understood that the Army reorganisation plans upon which the War Department is now working oal for approximately 1,700 annually 1,700 annually 1,800 and the now working oal for approximately 1,700 annually not satual commission and a minimum available reserve of 3,400 additional plane. This absend upon the preposed minitary establishment of 500 000 men in which total heart service personnic will be i,720 officers and 21 8,53 mag. There are to be 87 service squadrons, of which 42 will be assigned to coast defense work in the 1 nited States and Insular possessions, 20 will be pursuit squadrons and 25 observation and bombing squadrons. The typical Army simplane squadron includes 18 planes in service and their personnel CI for bolowration halloons it is understood that there are to be 42 divided into three wings of 14 companies each

What Are the Military Airmen Going to Do?-Now that the war is over, there are thousands upon thousands of airmen with nothing to do They have been returned to civilian life within the past few months Some of them have already gone into their former occupations, while others are still undecided But how do they feel toward flying as an occupation or a sport? That was the question recently saked of a group of demobilised airmon in one of the leading New York clubs One airman, who has done good work in the war, stated that when he landed from his last flight in France, he swore he would never again leave the ground. He confessed that he had flown purely as a military duty, and not as a sport Another sirman, while feeling the same way at first, began to long for an airplane after being in cavilian life for a few months At last accounts he was going about soliciting employment with American aircraft organisations as an airplane tester or exhibition Still another airman felt that there was nothing mercial aviation in the mmediate future, in the United States, at least, and that as a sport it was far too expensive for his procestbook. As a general thing, the vast majority of former military and naval pilots are eking fields other than aviation for their future efforts.

#### Autronomy

The Latest Astronomical 'Bull' We are again indebted to the I reach Journal I Autonomic for r acting from oblivious a delightful example of newspaper astronomy. A writer refers to the interest which enables an autonomer to at up all insist to watch a trainst of Venus. It is remark appear. On no kee a plue than the Educational Supplement of the I ondoor Tenus.

#### The Star of Highest Known Radial Velocity

From the spectroscopic measur ments made at Mount Wilson Observatory to determin the radial velocity of stars (i.e. the speed with whill this are approaching or reaching from our solar system of approaching or reaching from our solar system in the approaching of sealing from solar AC B within 1886 has a real of velocity of 39 kilomaters per second, the highest constant velocity of a observed for any star. Nint in this come Lalande 1986 with a velocity of 325 kilom ters per second in the opposite direction.

- A "Prominence" on Jupiter \ bright protuberanct apparently analogou \( r\_1 \) what prominence was observed on Jupiter last Jan \( r\_2 \) by \( N\_1 \) To Sag at, of Bristol accurding to a note in \( N\_1 \) time. It was attusted on the quadronal sed of the nrift quadronal belt and when first seen, about \( D \) P M \( 1 \) bouly little was on the eastern edge of the planet. With the rotation of the latter it could be seen as a white \( g\_1 \) twhich grow fainter as it advanced farther on the dish, \( \) into little prevented further observation. The following, \( \) into \( \) into \( \) the was according to the principle of \( \) the according to \( \) by the prevented further observation. The following, \( \) into \( \) into \( \) the same a a bright projection from the weeker \( \) himboring the was seen as a bright projection from the weeker \( \) himboring the according to \( \) for the properties \( A \) to \( 0 \) for \( \) \( 1 \) \( A \) the was seen as a bright projection from the weeker \( \) himboring the according to \( \)

Can the Corona Be Observed Without An Eclipse? -50 many impossible" things I we been done by astronomers that it would be rash! assert that no means will ever be found of observing the solar corons except during a total eclipse. Some b peful experiments in this connection have recently ben made at Mount Wilson Observatory and are still in progress Director Hale states that two methods of detecting the corona m full sunlight were tried by him many years ago. One involved satting the second slit of sp trobe hograph on the center of a dark line of the star spectrum. This would produce a reduction in the brightness of the sky without diminution in the light of the e irona as the latter s assumed to be derived from a c ntime me spectrum. The other method consisted of attempting to measure with a sensitive bolometer the relative religion of the coronal streamers and the sky between them Neither plan was successful. At the total school of lune 1918, Dr. Stebbins obtained with a potassium photo-electric cell large deflections corresponding to the total radiation of the corona (probably including the chromosphere and prominences) Professor Hale was thus inspired with the idea of using the photo-electric method in full sun light, and accordingly experim nts have since been made at Mount Wilson, by Flirman with two photo-electric cells exposed to the sky at moints equidistant (about two minutes of arc) from the sun s limb cells are connected with an electrometer in such a manner as to give deflections corresponding to the difference radiation received by them. If one cell were directed toward a coronal streamer and the other toward the sky between two streamers, the radiation would be unequal, and it was hoped that by this no ins the difference due to the added radiation of the corona might be detected Unfortunately continual small fluctuations were found near the sun, making the measurement of very small differences impossible, but the work will be continued with improved apparatus Professor Hale thinks it barely possible to send up balloons carrying photoapparatus, directed toward the sun by a gyro stat and controlled automatically by the heat of the sun's image, to a height sufficiently great to get rid of the atmosphere glare around the sun and allow the corona to be photographed without an eclipse

#### Automobile

The Mileage Helps Sell Cars. The trouble and the expense still boon large to the owner or proper two owner of a car and neary, man is convinced that the car would be all right if the vexitious result be avoided to or at least number 1. One in minufacture use to financiar the three cars and proper two purchasers that the care expect to ever 1.000 miles on a set of times. Before long the the ompany work exhaustively, into the records of their cars and found that its some cases individual in this is hit mids as much as 21,000 miles on a set of time. The poly records made are asserbed to the smooth rationing of the eight while results are asserbed to the smooth rationing of the eight valued consideration and are asserbed to the smooth rationing of the eight of which is some and the second field distribute its works.

Circumventing Car Thieves After considerable onsideration and discussion the National Autonobile Chamber of Commerce has come to the conclusion that there is no such thing as a lock that will absolutely prevent the stealing of an automobile the best that can be looked for it was believed as so much trouble for the would-be thirf that he will be discouraged because of the chances of dete tion while trying to circumvent the lock. The consensus of opinion was that the best kind of a lock is one that locks the genriet and the next the lock that prevents the use of the steering gear. The suggestion was made that a bill of sale containing a complete detailed description should be given to the purchaser of a car to be transferred in case of the transfer of the car to a new owner this document furnishing means for identifying the machine in case of theft

#### Highway Transportation Being Readjusted

The sudden decline in the demand for the transportation of mershandise has proved a hard blost to many concerns which during the war did a huge business over the roads. Large fleets, in some cases have been practically put out of commission. Some of the truckmen are reorganium, their business and altering their plane to suit new conditions which are normal conditions. Smaller concerns are roung out altogether. This is some means an unhability sign. It indicates samply that abnormal conditions have ceased to exist. In the abnormal conditions have ceased to exist. In the cases is suddenly that practically all were unprepared With some warning adjustment could have been made but the warning was lacking. The radjust ment period is an uncomfortable one for many but it is be theved that the true kine through it in good shape

Cooling System Precautions -With the approach of warm spring weather motorists who have been using mixtures of denatured alcohol and water in their automobile cooling systems during the past winter as an anti-freezing volution should be careful to reduce the proportions of alcohol to a low point and run strong percentages of water If the proportion of alcohol is too great the low boiling paint of the cooling maxture will result in averheating of the engine. As there is still a chance for a cold snap or two during April, the alcohol should not be completely removed but a 15 per cent mixture will give ample protection. If anti-freezing solutions including calcium chloride or other soluble salts have been used the motorist should flush out the cooling system thoroughly with water under city pressure to wash out any crystals or incrustation in the watertackets or radiator tubes due to evaporation of the water and consequent merease in salt proportions before the coming of real warm weather

New Steel Wheel -A Philadelphia manufacturer is producing a steel wheel for automobiles that looks very much the same as a wooden wheel It is built up con struction but is simpler than the usual forms because there are but few welds and these are easy to make believed that a wheel of this nature can be made as light as a wooden wheel of the same size and be very much stronger and not subject to deterioration or damage as the wheel of less resisting material would be Lech of the shanks or wedge onds of the spokes are steel eastings but these could be drop forgings and it is possible to make them either individually or to cast or forge the whole set in one integral portion. The tubular steel spokes are welded in place and the number at the upper end which secures the felloe is afterwards pecued over so as to hold the rim absolutely The felloe is of a rectangular box section and the tire carrying rim is, of course fitted outside this As the wheel looks exactly like a wooden one the motorist of conservative tastes cannot object to it because it is unconventional in annearance

# Floating Mines in the North Atlantic and Arctic Oceans

Trend of Ocean Currents in Relation to Dangers to Navigation from Mines Which Have Broken Luose from Their Bearings

By His Highness, Albert, Prince of Monaco

This ways I in North Athanta in seconds affected as rigid is the height in its offer in superlanding to the long matter of the state of the long matter of the long them to follow the course of the Gulf Stream toward the south the others to join those which after starting from the course of Iroland or from the Just Sca have traversed

the Arctic Orean and finally is a health; cost of Norway, I have momes which stated from the French Spanish Portugues and Moroccan costs of the Atlantic, as well is these whose point of departure was in the Canary I shands. Medera, the Artilles, the Bernardan or the

A res have entered the great system of necame in ultrium. However there is set up by the interest of the Gulf Stream and my previous studies a norming it have proved to be exact in their data, not only as regards the direction pursued but dwa

Mexico Shortly afterward they again pass into the current of the Gulf Stream at its exit from the Gulf of Mcxioo, exhibiting a tendency to remain upon the eastern edge, which enables them to visit the Bermudan Archipelago and arrive at that of the Asores

Arthpreago min arrive as use or the careers in the cut of the care of the oceans whirlpool formed by the Gulf Stream, whose saw revolves somewhere in the regular southwest of the Anores, by far the greater part of these mints which have come from the Antilles must crucial; indefinitely, according to the law which regulates the cutres of the florasm in that part of the ocean, known by the nums of Angasso Sea.

After having floated thus for a greater or less distance along the northern, the wanthorn, the eastern, and the westrn shores of the Archpelago of the Asores, but without ever traveling for beyond the 50th degree of lattitude toward the noth and the 15th degree of lattitude toward the south and twisted the degree of lattitude toward the south and without eatering the cold current to the word which hathest he castern

shores of the United States these floats coming from the west airive in the offing of the Lengist Channel, noar their point of departure, after having travised the greater portion of the space with a suparates the Azors from the Pitropean continual. They then start out afresh on their travelsial on the words after the start out afresh on their travelsial one two routes. He must have a farmed to the start out afresh on their travelsial matching the start out afresh on their travelsial matchinetic trav



Dutch mine sweepers clearing the North Sea

at the same time being exposed to that of the current which displaces the most of the witer. The floats of which I have made users this west experiment. Traversed, the Atlantic Ocean for a sour of voirssame of their midded have been quite recently or countered.

countered

There is a crimin analogy between the selfout sea at the floating miner implicated during the Crist Wan which smalled use to make use of similar methods in calculating the curse of travel of the latter at the possible however, the selfout selfout the terminal of the latter at the possible however, the latter is the possible however, the latter is the possible floating that the latter is the latter in the lat

scherble degree of danger which continues so long as they can railout. And it require extendible a number of the above compact from the hids where they were more I. In war between Japan well bases furnished example of extrapoper arrange for in I. feet their the tray I of they wandering bodies was not arrested by the cell of historia.

Since it would search be possible to receive the oriental beautiful statements of the force of the control of t



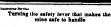
Ocean currents of the North Atlantic showing the probable path of drifting mines

with respect to the spect of travel According tomyrescatches the mines a first from their mourning along the cost of lurge and that of Africa, from the Inglish Chamict to the morther actremity of the Canary Islands have entered by degrees into the Capacity

cur at after having (taveled toward the south and coasting along without
touching the northern shores of the Cape Verde Islands,
withbiting at the same time, at rend toward the west
Thersafter borne toward America by the said equational current they visited the Small and Great Antilles
as his time the Bahama Islands coasting especially along
the castin region of these archipelagues are
the same times travel by a rule it was far even as the coast.



A mine anchor of the type that automatically regulated the depth of the mine



left the coast of Great Britain somewhere near the Hebrides and visited lecland doubtless also have disappeared among the floating ree along that coast I do not know whether it is a fact that a few mines coming from the west have managed to penetrate into the North Sea by the English Channel, but this is possible

tion not know whether it is a lact that a rev mines coming from the west have managed to penetrate into the North Sea by the English Channel, but this is possible fluth mines as may have been planted along the creat of the United States much have entered into the great cycle of flotsam after having been caught by the

narrow polar current which descends from the north and follows this coast nearly down to the entrance to the Gulf of

I have calculated the speed at which such bodies as these mines move from place to place, employing data obtained in my vious experiments with flotsain previous experiments with flotsain inconclusions thus arrived at are as follows. The mines which leave the English Channel with the oceanic whirlpool as their destina wind and constitute windpoor as their destina-tion travel toward the south, reach the Spanish coast near the lower part of the Bay of Biscay in the course of about two months After leaving these parkways they double Cape Finisterre and continue to be driven towards the south along the coasts of Portugal and of Morocco reach ing the Canary Archipelago 10 months r their departure from the Channel

Three years after making their original without counting a amount of time lost while passing through the Canaries, the mines have su coulded in crossing the Atlantic within a zone where or are found the equatorial current the curwhich gives birth to the trade winds A considerable number of them succeeded A considerable number of their succeeded thereafter in reaching the Antilles espe-cially the Archipelago of the Bahumas traveling at a speed of 10 inites per

And those muce which do not then become detached from the great swerm which have arrived at the entry of the English Channel and second towards the fjords of Norway after having encled Iroland upon the east and upon the west resign upon the east and upon the west commence ance their voyage around the Atlantic along the same path as the first The average speed calculated as required for the accomplishment of the evel by the mines is five miles per 24 hours

the muos is her mits per 24 hours.

The floating mines placed in the Mediterranean are not susceptible of having their course predicted except in a very small area situated between Cobroltan and the upper portion of the Baleani isles whither the general currents carry the waters of the Atlantic while the counter currents carry them towards the west along the coasts of Spain and of Africa

As for the mines which have broken loose along the eastern coast of the United States they have been captured by the cold current which loses itself in the captified by the cold current which loses likely in the Gulf Stream near its point of origin at its exit from the Gulf of Mexico, and have thereafter entered into the general circulation here described While the data given above show the principal lines

which are most dangerous to navigators because of floating mines, I cannot guarantee navigation against individual mines which may have been carried outside these general lines by storius

It is possible that the mines in question may float in the Atlantic for a very long time, since my experi

mental floats have done so for a quarter of a century, the best means, therefore of avoiding cata strophe from them us to direct the eourse of naviga-tion so that it will he as far as possible outside—the—cycle traversed by these dangerous engines of war This cycle causes them to pass and repass among the archipelagoes scattered through-out the Atlantic Ocean; it as even possible that large numbers of them ollegt around these slands attracted by a special force and may be retained, longer or . shorter time, by the influence of the tides and of local currents until carried again



This map shows why the German high seas fleet spent so much time studying the skyline of the dockyard buildings at Wilhelmshaven

the general circulation by the n thin of certain winds In the both of course, the will be open through the explosions produced by their chance encounters with some other piece of flotsamer with the rocks along

The regions most subject to visitation by these mines may be caumerated as follows the inner and southern portions of the Bay of Biscay letween Bordeaux and portions of the Bay of Bueen | ctw-in Bordaux and cape I mister; the western | stof Portugal that of Morosco and the archipelago | the Canaries as used Madera: the arca included betw-in the Inglish-Channel and the Canaries as particularly languous because, the winds which dominate this per in a of the Atlantic varies as crisin influence upon the true-partition of the super-ficial stratum of the waters and issest in driving the flotsam of the high seas toward these coasts. Between the Canaries and the Antilles the area visited becomes wider in the sea surrounding the Antilles the mines are both more widely scattered an limite upt to be destroyed because of being driven against rolly reefs. The return

towards I urope of those mines which liave failed to be destroyed is along a narrower path until the Archipelago of the Azores is reached at this point there is fresh danger of collision because of the accumulation of flots on similar to that in the Sargasso Sa whe has produced here by reason of the fact that this is the intral are of the wholphole council by the combined influence of the clif Stream and the cquaterial areast. The arcumulation of floating more who be accompensally numer. ous at the cuter is doing the periphery of the cycle they is low has been aug a unted by the continual escape of these engines of destruction during the last four 3 CRITH

The ships which travel lack and forth between lurope and the listed will find their greatest safety north of the line which runs between the entrance to the Inglish Chunclan I 50 degrees of latitude north and by foll wing this as far as 30 degrees of lyngitude west afterward turn ing downwar is toward the southern coast of the Boils of Newfoundland. The waters of the wrim current flowing from Am reat war I I prope probably mark the northern limit of the dangers which may be encounter 1

It may be stated in general that the slups whi h triv II tween the southern portion of Europe and the United States will en or rarge and the United States will en-counter their greats trasks in the virinity of the casets of Lirapic and of the Archi-pelagnes as fur down as the southern perturn of the Canary Islands and will find their safest course of travel along the line possing a little bit to the north of Madeus and following a traverse larger the nd following a tangent along the southern edge of the Surgasso Sca

From the same point of view the central region of the North Atlantic between 32d

degree and 13d degree of north latitude and between 3th and 50th degrees of west longitude (Greenwich) will be the most dangerous area. The danger of encountering a still active mine may continue for a long period of time siree the simple floats utilized (Continu ton pag 410

#### Locating Unexploded Shells on the Battlefields of France

By F Honoré
Paris (orrespondent of the Scientific American"

THI location in ground that has been fought over and subject to bembardment of projectiles that have failed to explode constitutes a very deheate problem, and one which must be disposed of before post agriculture can resume business at the old stand to be sure are relatively of little danger. Their failure to go off in the first instance is in general, due to broken fuse or an inert charge und chine that precautions are sufficient for their removal without fear of explosion Moreover most dud shells penetrate to a depth

that can hardly rached by a plou share Grenades on always active are never far from the surface and the least shock de tonates them

Impelled by the numerous accidents that have befallen cultivators entrust ed with the work of agricultural restora tion in the vastated regions M Unition, Professor of Physics at Nancy, has got up an in gemous apparatus to determine the position of hidden projectiles It is based upon the prin cuple of the Hughes induction balance invented to study the molecular struc ture of metals and allove and also used by the surgeons in (Continued on page § 16)



Instrument for locating unexploded shalls on battlefields, shown in folded and

#### Sir William Crookes

#### An Appreciation of a Great Physicist and Chemist

By John W. N Sullivan

Will the death of Sir William Crookes which took place in April 4th the world of serince mouries the loss of an investigator who belonged to a type which is very sold on met with memodern times days specialization is a fitness that it is hard to had a physicial who has done work in in rethin on or two tranches of physics or a chemist wh has d ne work in William Crookes we had a man who was a dim t descend on the grants tell men who a uld turn their ı uld turn their attention with equal cost to several 1 the great divisions f seigne and achieve will flisting at portance in a h. Sir Within wis lin in 183, and his life is one the state of the s

ursi great account. By VP i me abovey or the new mich lithallium. If we's led it this discovery in a u of analyses [10] unds of the set offerous dep set from the subblurie and min thereby at 1 like ide in the Harts. Mountains the substance being placed at his disposal () it i Hofmann in the year 1850 Spectres and Camination re-vealed a bright given line which he had never met with 1 of me and which he found to be characteristic of a new metal. During the next 12 years researches on the out culminating in his determinatim of the atomic weight. The amount of labor involved was immense and the care with which the investigation was carried out was such that even now Crookes value for the atomic weight of thallium is regarded as the best. With the ow accepted values for the atomic weights of oxygen and nitrogen the atomic weight of thallrum as determined by Crookes 18

In making this determination (rookes

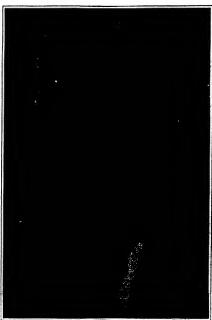
was troubled by irregularities in the weighings and as so often happens in scientific work was led to a new discovery by investigating these apparent errors weighings were made in a partial vacuum, but the action of the balance in these conditions appeared most capricious weight of the substance appeared to vary with the temperature but it fills iys in the same direction. As a result of his persustent efforts to trace the cause of these disconcerting phenomena he was led to invent th w'liwn instrument the radio-meter. The dynamical theory of gases at once furnished an explanation of the curious effects observed in terms of the action of the residual gas left over in the vacuum and in spite of the immense amount of work on the stresses in rarefied gases resulting from inequalities in temper-ature to which Crookes discovery gave

birth the subject is not yet exhausted
Crookes was thus led to consider the phenomena which take place in high vacua and in his sulsequent researches we have the very flower of his work. It is well known that if we pass an electric discharge through a high vacuum rays are shot out from the negative electrode the kathode culled kathode rays. They had been nevestigated before Sir William published he experiments in 1879 by Glucker in 1879 v Hittorf in 1869 and by Goldstein

in 1876 but Crookes in a series of brilliant experiments greatly extended our kn wledge of their properties and propounded the theory as to their constitution which in a refined firm is the one that is accepted at the present day

He showed that the kathede rays proceed in a straight but from the negative electrode when ver the positive electrode may be that they east a shadow when intercopted by solid matter and that they exert a strong mechanical action where they strike. He showed that mechanical section where this strike. He showed that they are influenced by an ingente tield the direction of motion being changed and that heat as produced when they motion is arrested. He also conducted some beau-tful appariments on the power of the katholic ratio to excite phosphorescence in preparations of calcium salfide shining with blue-woilet volley, orange or grean high, in disamonds shining with nearly all the colors of the rambow and in rubies glowing with a rich full red. Crookes considered the kathode rays to be matter in a fourth state, neither solid liquid nor gaseous. He regarded them as constituted of particles negatively charged and projected with great velocity from the negative electrode

In essentials this is the modern view of the rays xeent that while Sir William regarded the negatively charged particles to have molecular duncasions, they are uning a particles to have molecular rimin minons, they are now known to be very much smill; that the smallest known atom With real prophets might (rockes saw the part that these high vacua ph nomena would play in the advance of science, and in view of the fact that these phenomena underlie the while of modern physics and have entirely changed our conseptions of the material universe it is of the greatest interest to read the following



Str William Crookes

words of Crookes when he slow among his contempore aries forceaw the present devel pment in physics.
In studying this fourth state of matter, we s

in studying this fourth sinte of matter, we seem at length to have within our grasp and obscient to our control the little indivisible particles which, with good warrant, are supposed to constitute the physical basis of the universe. We have seen that in some of its properties radiant matter is so material as this table, while in other properties it almost assumes the character of radiant operary We have actually touched the border white in other properties it aimset assumes the character of radiant energy. We have study touched the border of radiant energy. We have study touched the border another, the shadowy resim between known and the known, which for me has always had peculiar temptatums. I venture to think that the greatest scientification. I venture to think that the greatest scientification is recommended to the study of the

let all these were, when no man did them know. Yet have from wisest ages hidden been.

And later times things more unknowne shall show.

Why then should witlesse man so much misweens That nithing is but that which he hath seen?" It wiplessant to think shat Mr William tived 1886

enough to see his predictions verified and to get a full view of that mysterious and attractive region which lies just over the border ( rookes next, in 1881, published a research in which he

returns to considerations connected with the dynamical theory of gases. Maxwell had made the great theoretical discovery that the viscosity of a gas is independent of the density, and it had already been the starting point for experimental observations by Maxwell himself, Kundt

u nac arready been use startung point for observations by Maxwell himsel, Kundt and Warburg, using the method or rotating datas. Crocket took up the subject and devased a very simple y- eP-wast own of appearatus. He merel's vaspended a lamina within a bulb containing the gas and noticed the subscience of its oscillations when it was vibratung. Hef. and, what Maxwell had himself foreseen, that Maxwell's law completely breaks down for very high exhaust ons
In the same year Crooker published a

paper n an entirely new method of spec-trum analysis, based on the fact that under trum analyzas, based on the fact that under the nuture of kathes rays a large number of substances omt phosphoreaeat light if he phreshoreaean light from the phreshoreaean light from but in some cases the spectrum is discontinuous and rookes made a special study of such bodies. Those experiments comprise his well known researches on the rare earths, especially yitras in some of its compounds and in this connection he obtained very valuable results, to which he made intermittent additions as time went of a new earth, characterized by as isolated strong group of lines high up in the ultraviselt ascribed by Sir William to a new element named by him victorium. In more recent times he did some valuable experimental work on radium. The substance known as uranium X was first superated from usrainum X consess. the influence of kathode rays a large nur

eparated from uranium by Crookes in 1990, by two distinct chemical methods. His well known and popular instrument, the spintharscope, was the outcome of his discovery in 1993 that the alpha rays from radium produce, by their hombardment, phosphorescence on a target of crystalline sinc aulnhide.

He married in 1856, when only 24 years of age. He was a member of numer, as accentific sometics both in England and abroad, and among numerous other honors received the Copley Medal in 1904 He was knighted by Queen Victors in 1897 and sohieved the greatest honor open to an English man of science by being elected president of the Royal Scienty in 1913

president of the Royal Society in 1913
His striking combination of diverse
gifts, keen observation, patient and inexhaustible experimental skill, together
with the glowing mind and imagination
of a post, have assured him for all time a
settled place in the great list of English

#### Italian Lavas as a Source of Potash

Italian Lavas as a Sentree of Potask

DR Hearty S. Washington, of the Carassic Gomphysical
total amount of potash present in the lavas of the air
total amount of potash present in the lavas of the air
chief volcanoes along the west coast of Italy that have
reputed lesurite lavas A conservative estimate is
10,00,000,000 tons of potash (K<sub>2</sub>O) Dr. Washington
believes that in these volcances Italy possesses one of
the largest waiths supplies of potash known to exist, if
not the largest important allients-rock nourses of
potash are also available in the United States, including
the Lesurite Rills in Wyonsing and the belt of planonable
that extends from New Jersey into Virginia. The latter
is estimated by Dr Washington is contain 3,084,000,000
metric tons of potash.

## The French Problem of Reconstruction—I

In the Path of the Shell

By C. H. Claudy, Special Correspondent of the SCIENTIFIC AMERICAN in Paris

It is not possible to visualise the English reconstruction problems from a platform constructed solely of American ideas. It is less possible to see all of the French problem from any usewpont 3,000 miks away no matter how added with photographs with descriptions, which is the latter section. with talks lectures, exhibits

with talks lectures, exhibits
It is an impossibility for the himman mind to grasp the
extent of the physical destruction in France even with
the direct and of the senses and if the traveler in and
around the devastated regions finds it impossible to realise the extent of what he sees and hears how much more difficult must it be far loss who must depend upon written word, the printed picture to grasp the amount of damage done?

So one starts the statement of the problem with the full knowledge that after all figures are only insensate things, and phrases like 'the town is totally destroyed to lack power to convey idea merely from their constant repetition and their utter madequary to repre the matter of the destruction or the desolation which hangs a pall of absolute lifelessness over the ares where the Hun the shell the wanton destruction and that not wanton but inevitable in war have laid their searing touch

England the reconstruction problem is entirely economic, political social The physical aspects of her post-war pussle are merely the mechanical ones of conversion of war plant to peace basis, of construction of de layed buildings, of putting in condition run down rail ds, of rebuilding shatters d industries of resettling al-tered labor conditions

In the United States when we talk much and do little (governmentally) about n construction the problem is big only because we have no true perspective upon it to English eyes it would ap pear small and to French eyes it does not exist! For the French problem of reconstruction is first and foremost a physical one— a matter of building homes again where are now piles of ruins-a matter of getting under cultivation land which a matter of making fields of grass and grain out of fields of barb wire and poles a matter of making roads, mending bridges, getting ina-chinery, creeting buildings in which to put the machinery, persuading absent and scattered population to back to the new town and into the new building to

run the new machinery Before I rance is ready to think much about economic reconstruction she wants homes for her homeless and tools for the toolless smiling towns where now gape raw wounds in the land scape—she wants fields which are of use to man where are now charnel houses, bone yards, pitted areas of clay and mold, useless alike for farm for home for pasture or even for weeds

So it seems reasonable to attempt to give some idea be it never so feeble, of the extent of the physical problem before trying to show what France is doing to remedy the results of war on her soil. One knows well that neither words nor pictures are adequate, but they are the only means by which those not able to come and see for themsives can get even a hint of what has here been done

swives can get even a hunt of what has here been done Figures are not impressive in themselves. To say for instance, that the total area of destruction in France is about two per cent of the total area of France is apit to make a reader exclaim mentally, "Oh, well, that's not so bod, after all—I thought about half of France was damaged! The total area in the devastated region is about 6,000 gauss miles of territory, supporting about two million propile Do not confuse this with the total invaded area of France, at the time the Hun was

farthest in he had control. It were two per cent of France At one time the invader of upred 15 000 miles including 3 500 communes containing over four million people. But even the Hun caunot lests a when he retreate in a hurry and much of what he night have destroyed he nurry and muen or what is ingut nave destroyed it postsponed because he wait it to inimas! Where armies awarg back and to the juckly in advance and rivest the destruction is superical agrain trampled cattle stolen fences raze! I votice buildings of which France has very few burn! But where armies face each other locked in position for some time destruction. ulnte and often it is is at the work of the shells of the defender as of the will inness of the invader

of the defender as of the will inness of the invader. Fine destruction of will fixerial virieties. Internally interesting the first probably the lardest to raisely sincert includes it to the raying of landings and the sambiliation of feret but also the churraing up of land so that it may be very before a top sell again forms upon it, capable of rais ignity sort of a crop. The intentional destruction where towns are burned bridges mmed and fruit trees girdled is bad enough but all the intentional destruction in France put together would probably not total a half of the mevitable result of the

. Yankee infantry streaming through the captured town of Varennes in the Argonne

landing of millions and millions of pounds of high ex-plosives in field and effect, in green orehard and wood I rance is faring half a by it different proble insist once and baseoursee smough for a few more af the world wants here to face moved. In fear it undergone one of them her army as another 1 warms, if orchipt in an eleminary is another, feeding, it will set a souths—and still the state of the set of the state of the state of the state of the set of the state of the Parace of the state of the state of the state of the state of the Parace of the state of the Parace of the state of the stat

France estimates (and no very accurate census of rance estimates (and no very actual ectasus or buildings as possible in so short a time) since the armstice that the total physical daming to buildings will reach the round figure of half a mill on structures and that of these, at least half (250 000) have been completely

one trover of the were possible to make the words carry
the meaning. One rides for sole after mile through the
devastated region and sees that things—these sites
where once were towns—these risbush heaps of stones
which once were buildings—these little mounds of stone
and dust and mortar with here and there a gateway. half a wall, a solitary pillar or the fragment of an a stratching mournfully upwards—and never a sign of life No man, woman nor shild, nor now, horse nor goat, no

bird no insect no rit ner eat nothing but I listed stone often so churned into the landscape that the streets of a once prosper use town in upletely of intersted, and
if it were not for map and go de me would not know that here stood a prosperous village

How can figures or work or printers make that They cannot and one can but feel regret at the malnity of the only means at hap I to paint the picture and the impossibility of evers readers making a magic carpet journey through the devastated regions to see fee himself what I rance is facing and learn at first hand what she has suffered af only that our own little reconstruction in iblems took their proper place in our minds and our own work

dwarfed themselves to their proper proportions!

However since figures are all that one has with which to paint let us write figures! A quarter of a millen buildings destroyed and mother quarter million damage I can make rather large figures possible. Trench government engineers say the average cost of the destroyed buildings prior to the wor was \$7,000 that their present cost of replacement is two and a half times that much and that the total cost of rel miding the houses damaged and

destroyed will be in excess of \$6 000 000 000 a regular Liberty Loan figure! Archi teets and contractors assu moderate in their estimate perhaps the government hal an eye to possible scaling down of damages if Germany is compelled to divide up her meomi pro rata among all the albes in indemnity pay ments for years to come and such associations call the total damage \$4 000 000 000 to buildings alone

I rame is a country of stone tile mortar brick the wooden house is almost unki own Arguing from this, many who have not seen a runed town have said 'but the material is there it is mercly displaced. It won t

the stone is right at hand!

But the shell does not merely displace stone it splinters it There are towns which are not runs but rubble piles where not only is there not one stone on another, but literally not one stone left whole where re-building must start with hauling away all the rubbad of what was once a town or the silection of a new town

sight This latter indeed seems so simple a procedure to au American as to make it

appear a necessity. There would be no question in American numbs that given a totally runned town now but a mass of rubble and stone it would be in finitely better to build a new town alongede the old. hading what material was available from ruin to building operation and making the new town with better streets straighter avenues better parks etc , than to clear away and rebuild on the old location

town to us means manapality the war zone is largely a little collection of houses more farmers residences huddled together for companion more tarmers residence and and diagener for companion ship and gregariousness. A wine shop a bakery a small store 10 houses—soile a town! The owners of the stroyed buildings do not want better streets straighter avenues parks they think of the little town as a collection of homes not an entity in itself. And the question of land makes the rebuilding of any other site one of tremendous difficulty

A father wills his land to his sons his sons to their

sons and so on forever Little farming land is bought and sold in rural France Land is all but worshipped there It is France they own and till, these peasants you have them sell their country? A man marries a gir

(Continued on page \$16)



Latest Plans for the Channel Tunnel Showing its Course the Goological Strata and the System of Drainage nine Earlier Plans for Tuben and a Bridge GREAT BRITAIN AND FRANCE DECIDE TO BUILD THE CHANNEL TUNNEL

A body over a century the problem of commercing Great Britan and Print by name more covere on in smalled of transmit than by smilns ship and stanner has been afrontice subject of invertigation by cap on smalled faceback, and potterns of Overland 221 [85] the smalled and faceback problems of the central school of the proposed by Heror Horest for smalled faceback from published and illustrated description of a plan proposed by Heror Horest for subsequent above by an eliquized in the formed of elibra proposed by Heror Horest for the standard and the subsequent proposed by Heror Horest for the standard of a motion of the second space of the proposed by Heror Horest for the standard of a motion of the lowest point by graving and the they were to the submemor railway the standard of a motion of the lowest point by graving and their they were to be more of the standard of a motion of the lowest point by graving and their they were to be more of the standard of a motion of the lowest point by graving and their they were to be more of the opposed along earlier by a satisticator against or by standard at another of a time from the supervised of the standard of an other than the supervised are the property and the standard of a motivate of the standard 
at was not wanting as a some of the perfortal nor in the imaginative faculty. The towers were

to best the name of different antened of the early. The tube was the provided with dass windows out tupper fleet and interscribeting plates were to those the light from the instrumed court was 100 for the fleet form the interscribed court was 83 400 000. In the hundred were of accusom the plate have ancluded readways carried aboves the channel on bridges received aboves the channel of the state and the rest in the short duries between the endress of the varies and aboves the studied of the rest and the best manning at a tobal and the studied with the best of the state and the rest manning at a tobal and the state of the state and the state and the state and the state and the state of the forth brings are largered by Missing the state of the forth brings are largered by Missing the state of the forth brings are largered by Missing the state of the forth when the total weight of steel in the whole structure would have been \$71 305 tonar. The pic bottom and carried through to firm, underlying shall by the well-known compression and through to firm, underlying shall by the well-known compression and the real-known compression and the real-known compression and through to firm, underlying shall by the well-known compression and the real-known compression at most different transferent properties.

# The English Channel Tunnel

Story of the Agitation for a Channel Tunnel from 1802 to 1919

WITH the exception of the Suer and Panama Canals, there is no constructive work in the field of civil engineering which has had so worldwide an interest as the proposal to link the British lales with the Continent by some form of roadway Although in later years the proposal has always contemplated the construction of a tunnel, the student of the history of this project finds tunnes, the student of the matery of this project mate that other methods, such as the building of long, low-level jetties, of high-level bridges, and of tubes laid on the bottom, were suggested and were made the subject of more or less serious investigation

#### Early French Proposals

The first definite plan was made by a French engineer, M statisen, who proposed to Napoleon I, in 1862 the construction of a tunnel which would afford a poet road between the two countries. To Napoleon, himself a great engineer of daring enterprise the plan runst have smed more feasible than to many of his contemporaries

In 1833 Thomé de Camond is said to have made very extensive experimental borings in France and England to determine the character of the geological formation His labors were indefatigable. Three times he went down in a diving bell to bring up specimens from the bed of the Channel, and altogether, between the years 1833 and 1836, he brought forward no less than six sepa-The first of these in 1834 contemplated a tube of iron plate laid on the bed of the Channel from Calais to Dover, the length of which would have been

2514 miles
Then, in 1836 he proposed the construction of a bridge 22½ miles in length, which he estimated could be built for \$160,000,000

His third proposal was to build two jettles, each ex-tending five rules out from the slore, with their outer ends connected by a pontoon bridge. This construction ends connected by a pontoon bridge would have been 21 miles in length

His fourth proposal contemplated a jetty reaching from shore to shore, with three navigable channels spanned

by swing bridges
In 1866 he abandoned his previous plans in favor of the more practicable scheme of driving a tunnel from Cape Gris-Nez to a point halfway between Dover and Folkestone. The tunnel was to be so located that it would pass under the east end of what is known as the

Varue Shoal, where he proposed to suck a construction shaft

Ten years later he modified his location so as to make a landing at Folkestone, and he proposed to use the shaft on Varne Shoal to bring up the excavated material and on varie enous to oting up the evaluated material and empty the spoil at the shall, the elys forming an island of considerable extent. In 1859 this plan was so well thought of that a Penenh-British Community was formed to look into it. The tunnel was to be cut by means of a Rotary Brunton Boring Ma thus, the submitted time was four to hve years, and the cost \$40 000 000 100 De Gamond died in 1875

In 1851 Hector Horeau drew at the plans for an ellio treal iron tube which is illustrate I on the preceding page

#### British Activities

Meanwhile the British I I born investigating the problem on their own side of the Channel and in 1866. Chalmers proposed the construction of two circular Chaimers proposed the constitution of two circular iron tubes, which were to be find on the list of the Channel. These were to be his lightly that the channel with timber. Channel channel that the tides would sit up the tubes and thereby ultimately form an imbankment 40 feet high by 150 feet wide. The

we should state, just here that for the shove date on We shourd save, investigation and fir the following account of the British and of the entriprise we are indicted to a form of the British and of the entriprise was an indicted to a November and Descenber, 1940, to which the reader is referred for fuller particular. Chalmers was followed by the first Marden who designed a tube with a doubt slin, the number space that the with a doubt slin, the number space when the shares to be followed in with control. The

between the skins to be filled in with concrete estimated cost of this tube was about \$5.2 HM (AM)

In the early part of the latter half of the 19th century considerable attention was given by engineers to the considerable, attention was given by engineers to the possibility of pneumatic operation of trains and we find that subsequently to Marden's proposal Butten in and Révy got out a design for a set tion tube which was to be carefully machined on its interior face—ind closely fitting (ars were to be propelle I through it by paramatic

Zerah Colburn, that prohib and original engineer proposed the construction of it tube in sections in a

long drydock. When a section had been completed it was to be forced out the nighthe lock gates some form of stuffing-box being contemplated which would allow this to be done

Then came Page who in 1870 proposed to moor at inters ds seroes the Channel eight irea shafts and to lay They were to be covered with concret

Next came Peter W Barlow who proposed an iron tube which was to be surrounded with 21crt. Cambros of brick laid in suphalt. Ottosid of the bark wage was to be a covering of six indies of from the Barlow wag optimistic set to cost. Believing that the thing could be done for

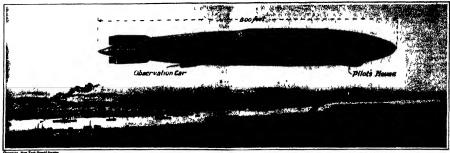
Then came Paul I. Bishop with two (lliptical easi-ton tables which he believed that he could put across for \$110,000,000. The tubes were to be lined with 12 \$110,000 000 niches of parck find in concut with a facing of semen Irution was to be either by steam locomotives or time ilmatic

#### An Exhaustive Investigation

This brings us to the great Sir John Hawkshaw m company with Sir lames Brimlers and Mi. William Low began to study the problem in 1864 and devoted an numerose amount of time and energy to the work 1 xtensive borings were made on either shore and a Extensive norms were mine on either short and a kind a through geological examination was made of the bottom to determine the Lix of the strata. As the outcome, a complete Chainel tunnel scheme was developed by at John Hawkshaw as engineer of a company formed in 1872 Sr John realized that the propert was first and list a geological one. Special apparatus was designed for sounding and securing specimens of the bottom. The question was to determine whether the thickness of the lower beds of chalk as ne sured on the white chils on the Buttsh and Irench sides where all the beds are exposed was maintained after the lower beds dip beneath passed was maintained after the lower norm up nemeating the sea. The borings showed no great duminishing of thickness as the brids were followed seaward from the outerop. A concession was attained in 1875 from the Jrinch and an English hill was presented in 1875. It should be mentioned that though the attitude of the British government was always conservative, the I reach (Continued on page 416)



In the foresteered the hadder of the Channel Tunnel near Bayer; beyond is the rente of the Train Ferry established during the war



How the proposed rigid dirigible for the London-New York service will appear when flying over a conventional landscape

# Aerial Greyhounds of To-Morrow

Some Possibilities of Airship Transport Service in the Immediate Future

N I W YORK to I ond in it we days! Traveling you the air with the smoothiness and speed of an express train while enjoying the space users and accommodations of an order liner! Making the translature crossing with a fe ling of so trity which has never before been equil !!

These are not sacrifs for the projects writings of Jules Vern. or the image are cessay of II. G. Wells Far from being the print is 3 void imagenation thay are the cold or lusions of a dading British organization which has set to work on the prib in of commer rid working. And this organization by the way as a wast and undimental one indeed during the way and for many years before its mane has he in a sunonymous for battleships and hand grean its surpleme and drightless maching units and hugs more its. Busing their calculations on well known per fairs necessarily and comprete worked out an impossionate right can be described by which do it an impossionate right can be described by the worked out an impossionate right can dempete a worked out an impossionate right can be described by the property of the control of the comprehensive for the control of t

build a rigid airship to earry 50 ton's I passengers and fright for an on-stop voryag, of 10 000 miles at a speed of 80 miles per hour. It therefore may be definitely accepted that for voyages on which it is necessary to make a non-stop flight between points more than 2 000 miles apart. The durighble is the only mained of serial transport possible and it may also be softly stated that the airship will always be the mist on united means of transport for non-stop voyages of more than 1 000 miles. So it follows that the dirigible must hold the held for long distance, voyages such as the true occanic routes. One of the over a concept, is a Distance of the number of the

long distance voyagos such as the trus oceanic router (moder however a concrete us. The ungineers have chosen the direct non-strop passes uger voyago from Indone to Nive York—a minutum distance of 1,000 miles—for their comparison he tween of rights and the plane services. The analysis is made of the cost of operating a service of two crossings; in each direction of passes, which was the service of two crossings; in each direction of raving our arrange span, it of 30 tons of passes, and the service of the control of the cost of operating a service of the s

catablished in all likelihood at about six cents per ounce. The time taken for the journey would be two and a half days from London to New York by the southern rout and two days from New York to London by the direct route all these fasts of course being based on rigid dirigibles such as have been purposed.

Turning to the strikane, we learn that it is impossible to run as slightless service direct from London to New York but with the largest and most efficient machines at present considered practituable it would be possible to run a I ondon to New York service with intermediate tops in Ireland and Newfoundland for right unkiment of fuel etc. The capital required in this cases would be \$28,800,000 and the cost of operation would be Pasenger rate from fundom to New York, £115, which figures out at the rate of some IG entar per passenger mile, while mail and other light in rehandles would be charged for at the rate of 50 rent per ounce.

while mail and other rigid incrementage wound or consequently for at the rate of 15 cents per ounce.

The time taken, allowing for stops in Iraland and Newfoundland would be two days. It seems obvious that for a regular and established service the cost trans-Atlantic dirigible service is less than half that of the arphane and the time taken is practically the same Ir must however, be pointed out that if the arriship stopped at the intermediate points as necessary for the stopped as the intermediate points as necessary for the maintained of the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as the intermediate points as necessary for the stopped as necessary for the stopp

airplane a considerably greater amount of passenger load could be carried, and the relative cost of airship operation would be considerably further decreased

#### Applicators of Distance

With the development of anxiety arrange of the temperature of the world, it is conceivable that on important city will be farther from Loudon than 10 days journey and the engineers have given some representative arrange results of the second that the series of the second that the series of the second that the series of the second that the second th

The advantages of arrhiptransport will be most apparent for long ocean journeys, and it is proposed that the best route for the first service would be between London and New York, as the is the route on which there is the greatest demand for a saving in the duration of voyage, and a large amount of passeager traffic would be immediately available once the advantages of the service were demonstrated. After the establishment of the



How the nose of the trans-Atlantic dirigible may be moored to the revolving beed of the mooring tower, serving se an archorage and gangway combined

#### Wherein the Dirigible is Better than the Airplane

The outstanding and portline outstanding and portmention of the control of the conmention of the control of the constanting to the control of the constop voyages of long duration which we control of the contion which we control of the contion of the control of the contion of the control of the contion of the control of the concontrol of the control of the con
trol of th

An arriany of the arx proposed by the organisation in mel, of a capacity of 1500 000 seudar feet which could be built immediately and be housed in oasting sheds can carry 15 tons of passengers, mails and so on for an air datance of 4800 miles at a speed of 90 miles per hour And it would be quite a practicable proposition to

trans-litiantic service, other services on which another present would offset great commonles in sinns would be a service of the service of t

Further than the saving in time in the actual journey, there as the saving by using an airship service in the elimination of the time taken for trans-shipping and watting at the various ports and so on, where the airdromes could be situated quite close to the terminal stations. Owing to the variation in weather conditions, there would be of course some latitude in the time of arrival at the destination but in those cases where there is a saving of several days in the total journey to be of much account.

Much more could be written on the time-saving and other features of the serial transport

service proposed, for the engineers have gone down to the very bed rock of all the factors entering into the operation of the durighbs. They have figured out the costs to a nicety even including the costs of averhauling andrepairing, insurance preniums, depreciation, interests on capital invested, fuel, row, and so on

But from the viewpoint of the layman the interest now shifts to the oraft to be employed. After all, it is the dirigible covering the route which deserves particular attention, since all plans stand or fall by the practicability of the

#### A Greyhound of the Skies

In brief, the proposed rigid dirigible, which is herewith illustrated as well as in the cover illustration of this number,

cover illustration of the number, the same the following characteristics. Gross gas capacity, 1500 (201). So the feet overall length, 500 (201). So the feet overall width, 100 feet, overall height, 105 feet, total lift de Be pounds per 1,000 cubr feet). 105 tons, disposal lift, 68 tuns, total maximum power of engines, 3500 horse-power runsing horse-power, 2,000, speed at full power, 150 miles per hour, speed are running power, 60 miles per hour, and traught, 300 hourse for 4,800 and fraught, 30 hours for 4,800 tons of passengers and fraught, 30 hours for 5,00 miles for the same per hour speed to tons of passengers and fraught, 300 hours for 5,000 miles

It should be noted that the "disposal fit" is the lift available for fuel and oil, stores, rew and passengers, mults, and freight The particulars and performance attack are based on pure at desagn, and the actual performance of shaps of 2,000,000 cubic fet capacity now in service It is believed that the figures given are conservative, and that actually the increased use of ship would enable greater structural efficiency and consequently greater dis-

enable greater structure encreavy
and consequently greater appreciate
possable lift available than that specified
The shape of the trans-titatut dirigible is to be of the
most perfect streamline form within the limitations of
constructional requirements. An internal keep do orridor,
running along the bottom of the bull, will afford access
to every part of the dirigible Petrol and oil tasks and
water ballast will be contained in the bull structure.
The outer covering would be made of special weather
and the contained in the bull structure
and the contained of the bull structure
and the special properties of the special properties

The gas capacity of the dirightle would be divided into gasbage made of suitable rubber-proofed cotton fabric lined with goldbacter's skim. The gas-bage would be fitted with automatic relief valves and handoutcolled masseuvering valves, operatod by the pilot outcolled masseuvering valves, operatod by the pilot

from the navigating quarters located well up forward. The engineers have plained on an amechanic rears or "power eggs", each contaming a 600-horse-power engine, and contaming a 600-horse-power engine, directly connected with a propeller little at the aft end. Thus the dirigible would have a maximum power of over 4,500 horse-power, the engine which give not divided by their maximum full power when flying at a bright of 5,000 feet. The engines would be fitted with special exhaust alternees in order 1 reduct the exhaust noises to a minimum, and special is unsaftration would be given to the traismission gear, cooling system, self-starting features, and so on

#### Promenade Decks and Salons Among the Clouds

But how about the hying quarters now that the mechanical details have been glained over?
Well the main living as animolations would be in a salon fitted along the top of the aniship provided with

The the no distant future captive balloons, equipped with electric lamps o high power, will mark important airdromes and landmarks for the aerial pilots of commercial and pleasure craft.

tables and chars in the style of a Pullman car when would enable the passengers to be confortably accommodated during the daythen. Part of this salon would be fire-proofest to allow of being used as a most coron. An open shelter de-k would also be provided at the aftend to enable the power are to take the aftend of the provided at the aftend to enable the power are to take the arms of the salon would be proved in white nations, giving the

A passenger els vator would be proved dor communication between the passengers quarters and the lower part of the ship. An observation as fitted below the hull towards the aft end of the ariselps would also enable passengers to observe the lead and sea mimediately below the ship. As for sleeping quarters those would be in the form of bertha prevailed in small cabins fitted on top of the huge hull, forward of the living asliums. Cooking would be done in a mess ketchen, thoroughly equipped with electrical coding apparatius. Meals

would be served in the salon. Heat for salons and sleeping quarters would be radiated by electric heaters. It is interesting to note that such a drigid be would be equipped with the last word in wireless apparatus, enabling it to keep in touch with land stations and ships, and also permitting of the reception of directional signals at all times. In fact directional wireless against today make it possible for on ariship to be publicly with considerable accuracy (v. m. if it is enshrouded in thick fogor is operature).

So much for the urship Bit how about the landing facilities? It has often been said of the dirigible that its fac better in the air time on the ground and that the problem of getting it up as nothing compared to the problem of getting it down-walked. Again we find that of bringing it down-walked. Again we find that the British engineers have done their work well and the British engineers have done their work well and the British engineers have done their work well and the British engineers. At the Granual point of each

archip and come points again a service make, provision for the following. Ist. An ardrome of shout one mile square. 2d. A double arrhip skid capable of housing two of the arrhips. 3d a mooring-out tower with how mooning gear 4th. Medianural huiling gear for transferring the mooning gear 4th. Medianural huiling gear for transferring the to the shid. 5th. Hisdrigen containty plant and storage of the Meteorological office and wiseless telegraph in the storage of the mooning tower to the singular different plant and storage of the mooning tower to the singular workshops and the storage of the mooning tower to the singular different plant and storage of the mooning arrangements for the ardrome. 9th.

Only the Common should be within their communication and a what diestance (from the city served by the arelings rave, and, if possible, would be advantage only situated near to a chimical works where hydrogen would be obtained as a bright common to the interesting to note that the British engineers have figured on hydrogen method of the common that is interesting to note that the British engineers have figured on hydrogen method of non-inflammable facilities although it as produced in the common through the common although it as the common through the common

place of the fermer.

In double whele required to house the sace of air-shipe called for would require two be rise and with a minimum size of 850 feet long 150 feet wide and 150 feet long 150 feet wide and life feet light, with opening doors. The sheeds would be provided with by drogen filling mains and will gar for slinging the air-ships from the roof when defaced for ments would be made to each senset would be made to each size ments would be made to each size ments would be made to really size of the ships with gos, for I and water ballar!

#### A Hitching Post for Dirigibles

Most interesting of all the airmore arrangements however in
the proposed moning-out scheme
which has been made the subject
of a paten by the British organination. This scheme which forms
the opening page subject of this
number would be introduced at
tach surdrome in the shape of a
fixed mooring tower about 150

feet in length, with a revolving head to which the archip would be rigidly attached by the nose and he able to turn round in accordance with the direction of the wind. In turner would be provided with a huiling in winch and rope to hall the ship up to the mosting point. Means would be provided at this mooring tower to enable the archip to be supplied with hydrogen fuel and ground to the top of the tower would enable passe agent to embark and thus mindre while the arriving was riding at the mooring, and would also serve to convey mails, freight, stores, etc. to the ship. The airship would the moored to this must aim ride out during even the worst washes, and would only require to be taken into the washes, and would only require to be taken into the his scheme is a level or exchanged and the scheme in a level or exchanged.

# World Markets for American Manufactures

Edned by LYNN W MEEKINS

A department devoted to the extension of American trade in foreign lands

#### Readjusted British Industries

A MIRICAN manufactor is whose plats were en-gaged in war work at fill wing will not rot the changes now going on in British fit res. It has proved cours an both the latted states and Great Britant return to a pice basis than it wis to go upon a werhoos. The striking ficting the little matry is the imbre of firms that have time by the pice has a the little matry is a right list hat are being map it let just he life for the inpany in I i stor used t leindle American exponenters at will make its own in a bases henceforth I rom the manufacture of valuante pressings for magnetos

an ther leacester from las change lats line to funtum poss r placing American makes. British plant that produced air planes f r war use or turning out furniture ir in vals s automobile i cossories capstan lathes in I marme in t rs. Great estab halmones from which continuous streams of munity us were p ured into I rance have been renverted for the manufacture of such articles as the trical fittings presses for bit kninking files and springs creain separators datry stensils shot machinery and locome tryes

No longer required to make millions of yar is of army cloth the British textile inclustry has readquated its louis and undertaken 1) regain its streng hild upon foreign and colonal unirkets. There has been a movement in Ingland for the enlargement of the or ducing units in order to reduce the manufacturing rost of th diversals d lines of cotton goods with which the natives of India China and other vast

ton natives or infinite and supplied Ler-consuming countries are supplied Ler-many usockets sell to British mills nearly all the hossery needles that they employed these are being made now by several former ministion plants in England. In con-nection with the restoration of French and Belgian textile industries a great dial of the necessary machinery will be sold by British in mufacturers whose equipment is already familiar to the owners of the looted or de-visitated factories on the Continent

One-third of our six billion dollars, worth of exports in 1918 went to the I nited Kingdom, which has been a constantly growing market for American goods. In dealing with our transationic customers we have the advantage of a common language and the benefit of

transportation Inst now the British Covernment is regulating the trade in a number of commodities in iking it necessary for importers of certain American products to obtain licenses but this restriction will be relaxed as the exchange situation improves in the five-year period preceding the war the I mited Kingdom bought Cerman goods valued nearly \$1 400 000 000 total m 1913 being over \$100 000 000 m excess of that in 1909. This business has come to the United States and we ought to keep most of it.

Many American manu-facturers have obtained a grishure of British trade hy cataliling branch futries icr so the cean. One

hrm that makes per goris
allowed five years to the working out of such an experi and well rest of the working out or such an experiment and I in I it so, essial within half that time.

Owing to the high r wages paid during the war the standard of hymn, in Creat Britain has improved to such an extent that Am a me expat recan sell more of our products there regar liess of the industrial changes that have been mentin l the demand is for standard lines inclining toward the luxury class

#### Exporting the Bolsheviki

"NEVER hant for trouble it will always come to you" is an old saying und even when not sought but merely expected that unwelcome visitor is likely

to appear. Upon the signing of the armistice it was freely predicted that we should have hard time as in this country, the radigatement to a peace basis involving curtailed prodiction and a great deal of unemployment. For-tunally, we were not in the war long to ough to make a vast amount of rearrangement accessary We did how-ever tune up our industries to such high speed that the domestic market is no longer capable of absorbing the output and those manufacturers who haven t gone into foreign helds are the chief sufferers

American goods are shipped from Atlantic, Pacific and Gulf ports unless they are sent to Canada or to



A British spinning will using American cotton

Mexico by rail, and around these ports is naturally centered most of the interest in our export trade. It is from inland factories, though, that a very large proportion of our export products comes and the more energy displayed by neumfacturers in the 'Middle West and in other sections the more speedily the United States as a whole will be placed upon a firm world trade base.

#### Keeping Our Workmen Busy

The first need of the American workingman today is stability of employment—the assurance of steady work," said a noted economist the other day. He proposes the passage of legislation compelling manufacturers to

Sweden used to be the principal source of supply for safety matches. The war handwapped Swedish mani-facturers shutting off their raw materials and taking away much of their shipping space. Along came Japan-and that leads us uto a sparsely settled region not far from Lake Michigan. Not long ago a paper mil in that section recovered a very large order for the particular kinds of paper used in making the little boxes in which safety matches are sold—for the exact kinds, in fact, that Swedish manufacturers employed-and this order was shipped to a large match factory in Japan Now, at least one company in the United States is producing

safety matches, but the quality of American products is so universally recognized that our manufacturers are not compelled to copy the packages of their foreign competitors in order to gain their share of the world a business

Incidentally, that one mill is turning out no less than 420 different kinds of wrapping paper, lots of them for export wrapping paper, tots of them for export "When the war began we were making two grades of a certain variety, each in seven weights, or 14 separate sorts of paper," the manager told me "The War Industries Board reduced the number to hve, which effected a real economy for us As soon as this emergency branch of the Government was discontinued the paper trade, instead of going ahead with the five lines, increased the number to 191 So, of course we have to supply them

#### An Expert Order and Its Result

He went on to say that before this mill had become interested in export orders he had found it almost impossible to develop an ambitious spirit among his employees We tried almost everyhad found it almost impossible to develop an ambitious spurt among his employees. We tred almost everything imagnable to induce the man lower down to suprice to the job higher up "he said. "Every now and then a bosus was given Working conditions were improved Many welfare plans were introduced. And still Henry Jones, receiving \$15 a week was satisfied to keep on drawing that amount instead of hough go promotion to a higher position. We were surprised one day to have a foreigner call at the mill. He was traveling through the United States and somebody had told him that we specialized in varpping paper, a line that he handled in South America. The result of that visit was a quite that the respectable order. After he

respectable order had placed it I gathered all our employees during the noon hour and gave them a plain talk

"'Heretofore we have been making paper for Brown & Smith of Chicago and for the X Y Green Company of Omaha' I said 'both of 'Heretofore of Omana I said both of them within a days railroad ride Once in a while our shipments to them have needed a little adjustment, which we could make easily and quickly Now we have and quickly Now we have an order from Elsenor & Garcia, of Buenos Aires, thousands of miles from here It's a trul order, and a pretty bug one at that I want this shipment to be all right in every respect. Each and every direction of the customer must be fol-

of the ouseomer must be followed absolutely. There so not to be any comeback on it!

"You would be surprised at the effect of those remarks. The men formed in little groups and I could see that they were decidedly interested. The paper that went to Argentian was exactly what Eleonor & Garon had specified, through thair representative, and it was pasked just right. Other orders followed, our coport business grow. In the reading room that we started through the proper many products. Now we feel that the proper monetive to dishe the ladder has been found." een found "



One of the largest and most up-to-date loom weaving sheds in Lancashire, using American cotton

pay an unemployment tax-50 cents a day to each man he is laid off on account of a slack in orders ever the merits of such a measure may be, it is certain that trouble would follow in its wake. The one great unemployment cure is foreign trude which means a conunemployment cure is foreign to the which means a con-tinuous flive of business and a maintained or increased working force. When the domestic market is dull, a harder driv may be made is I alin America or in the Far East. The point is that American products must be shipped abroad steadily and foreign fields must be sare-fully cultivated all the while. Export trade is not a matter of getting rid of a surplus. Our would eastoners want American quality goods backed by officient service

#### ring Erape don at the Panama Canal

order to study water supply con-Meons at the Panama Canal an evanorer has been established at Gatun Lake Sing is a copper pan, four feet in diameter, which is kept full of water and the quantity of water that has to be added from time to time measures the amount of moisture that is taken up by the atmosphere pan is carried by a raft which floats on the surface of the lake At one side of the raft there is an anemometer which keeps a record of the wind while on the opposite

saids is a rain gage
Evaporation at Gatun Lake is very
copious, despite the high humidity of that
region During the eight months of the region During the eight months of the rainy season it amounts to four inches per month and during the four dry months seven mohes per month. It must be re-membered that even in the dry season

ere are rains practically every day, and yes the evaporation is almost the same as that of the flatton Sea despite the ard surroundings of the latter body of water. The high evaporation at Panama is due to the heavy winds which are constantly



The evaporation station at Gatun Lake

If gas masks are purchased for industrial use they should not be bought as one hand from returned soldiers but new from the Ch mical Warfare Service and

Stitist pit 10 right—I German me mask 2 Rissian me mask 3 Rissian me mask 4 Britals me mask me made to motor truck drivers 8 Ristials arise mere requirate 0 Rispretioned mask with metal face-piece Middle ran—I Piert emerge 1 v on thost put into practice after the initial gas attack in April 1915 8 Brittish PR behavi correspont to fince the 1915 9 British bor respirator standard type used by Britals draw 10 Procch M 2 mask regimal President proceed with Mysting of 1918 1 11 Original President and Strategian President processing the 10 Artificial Art 7 mask metals for the 1915 1 American many mask in 12 Preside A R 1 Merchan 10 American and President President Mysting of 1918 1 11 American model 1919 mask in up vicel type ready for production at end of the war until 1914 American model 1919 mask in up vicel type ready for production when armistic was stanced. Stuting left to right-1 German gas mask 3 Russian gas mask 3 Italian gas mask

Gas masks used by American Alited and German armies

advice should be sought from the service as to the adapt-

#### Automatic Wireless Receiver Which Anyone Can Operate

THERE is much of the proverbial needle in a bay-stack problem in modern radie t kgraj by and telephony. Of nutters to be slorely tuned it been nor nutters to be slorely tuned it been nor necessary for each rest to be just us sharply tuned or alpest their case the meaning waves. This is neither the cuertor must capacitis and their civing components capacitis and Mort civing components so us constantly to so ur the intercrange of radio wave length. Only in this manner does it be one possible to text all calls and messages whether they be of a multiple of the source of the tary commercial a coursency nature

I ully realizing the possibility of a vessel calling for help in any arbitrary wave and not being heard by epirators in the immediate vieintly because they would not happen to be searching through all wave lengths at that moment, the framers of the radio laws have made it

compulsory for case is to operate their transmitters either on 300 er 800 meters. In this manner, they believed all wireless operators would be cirtain to hear distress calls

within their range for the reason that they within their range for the reason than they only had two places on their sets at which to listen in However the framers of the laws of the London Convention, in 1912 also massied that the transmitters should be sharply tuned. Thus it now happens that numerous stations in the same locality may be winding on the same wave length with the result that much inter-ference is caused. As matters have here tofore stood therefore at has been a matter of deciding between finding the proverbial middle in a haystacl by permitting trans-mitters to use any desired wave length or inviting under interference by insisting on the use of one or two standard wave

It has remained for Roy E Thompson a radio engineer of New York City to develop an automatic receiving set which makes it possible to explore through all the wave length ranges so that any transmitter may be detected without under trouble on the operators part. In other words using the sharpest (uned receiving ereuit hich makes for the most efficient results Mr. Thompson comploys an electric motor for mampulating the receiving components from the lowest to the highest range from the lowest to the inguest range at regular and recurring intervals. In fact his receiver may be likened to a searchlight the motor-driven receiving set—sweeps the ether so to speak in the same way as a searchlight sweeps the horizon. This means that there must be a gradual and continu ous sweep from the shortest to the longest ous sweep from the shortest to the longest wave length within the range of the instru-ment. Thus all wave lengths are tuned for in the course of a each of operation, and when the operator detects signals which he

desires to receive at length he can stop the operation at that point as long as may be necessary Briefly, Mr Thompson's automata receiving set or

uni-control reserver as he calls it consists of a more or less conventional

circuit comprising inquetance by many turns and Iv single turns at variable condenser phone receivers the fixed condenser detectors and so OH

trolling the indu tances together with the condenser are continuously oper ated by means of a train of gears driven by an chetric motor through a flexible Lhus the combination of inductance and ca pacity is such as to (Conf d on page 417)



Interior and exterior views of the automatically-operated receiving set

#### Peace Uses of Gas Masks

A MONG the many articles of war squipment that have little or no use a squipment that have little or no use in time of peace gas masks hold a promi-ment place. Being of rubber they will not keep for an indefinite period of time and they cannot be stored away for use in some sucy cannot be stored away for use in some future war. Accordingly our soldiers are allowed to keep their masks as mementos of the great war and the public can buy them as souvenirs from the Chemical Warfare Service

There is the danger, however, that these asks may be put to uses for which they re not at all adapted — It is quite natural for the public to assume that masks which for the public to assume that masks which have stood up against all the deadly poisons which German ounning could devise to overwhelm our men, would surely afford adequate protection against any gas that might be encountered in our industries might be encountered in our industries. But such is not the case. There were certain gases which the Germans could not use because they are so light that they would rise quickly and would readily be ed in the atmosphere | There were dusipa commonly found in chemical works. Fur-sommonly found in chemical works. thermore, it was never possible to obtain in the open battle field the high concen-tration that is often to be found in enclosed

The present filling of the canisters gives no protection against carbon monoxe practically none against aminonia fumes
The Chemical Warfare bervice does not guarantee

perfect protection in heavy smoke such as is sometimes produced in a burning building, since no tests have been made in that line but undoubtedly it would be of con-

suderable service in such conditions
The life of the cannister filling is also a problem. It is believed that if kept in a dry place it should be of ionaderable protective value for a year, but the only way of being sure is to test the helmet in a gas-filled room. If it fails a new canistes may be purchased from the Chemical War Service Eviary gas masks dustrial service

## The Motor-Driven Commercial Vehicle

This department in decoded to the interests of preast and prespective owners of motor trucks and desvery vagons. The editor will endouser to answer only quality relating to mechanical features operation and minagement of commercial motor schicles.

#### A Modern Gypsy (aravan

A RI SIDI NI of I is Angeles decited he would like to teur the United States gypsy fashion yet he dishked to frego the pleasure and confrts 11 n ring one pressure and control of a The problem was solve it his sit-taction by disigning special violation and installing it on a light track of issue the best statement. The body is unusually come it is in b as may be seen by refreing to comp tog illustration the veli 1 is pract live a house on wheels. He I clay in living a a house on whichs the letter to the large living comported it that it is a based as a sheeping it it light a kitch nects and a lath table secretly as meany a methopolitan apartment. Despite the large size of the ment Despite the large size of the vehicle it relight in weight and is capable of attaining spe ds of 25 miles per hour when running over good roads. The driver's compartment is well enclosed and serves as a front half or entrance to the

#### Tractors for Hauling Airplanes

Till airplanes that were available at the outbreak of the war were not very large or heavy and could be easily handled by a few men and moved around thandred by a rewinder and motion of great deficulty. A great advance has been noted in aircraft design and airplanes of the triplane type with 120-foot spread and flying boats of even greater size are now commonplace. The weight of these large eraft produdes any attempt to mancuver eraft produces any attempt to manchest them by man power yet they must be brought out of their bangars to the flying field and returned to their risting places. when they have completed their flights Horses and automolides were

tried and found wanting so agricultural tractors of the agricultural tractors of the track laying type were finally resorted to and were found ideal for the purpose. The night handing squad-rons equipped with Handley

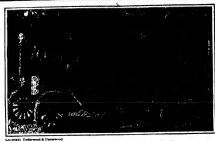
Page machines on the Albed front all had a small tractor as part of the maintenance and operation supply outlit and a very important adjunct they proved to be in towing huge machines weighing tons around on the muddy fields of trance The track laying tractor is ideal for this pur pose because it provide maximum traction without cotting up the surface of the field is a wholed trutor would when eleated or spiked traction inembers were spiked traction increases were included. The ampany ing illustration shows the utility of a tractor truck laving track laving traction members when sighed to hading out a fill large hading interaction of the large

fiving t its. As the L it is reputed to have flow; with "0 passengers it is evident that it weight is maideable.

A special who lift is kissis dim hauling out to supplie the Lull and runs on Is la I on a concrete traks mal 1.1 runway The train a law moves the heavily londed to knowledge thus saving valuable in wrath rich ing liability of dam right to tiplane structure which might rail if it was handled by a gang of men

## Heavy Traffic on New York Streets

IN an address befor the American Road Builders Association ( M Pinckney, Chief Engineer | Highways for



A house body mounted on a light truck chausis

the Borough of Manhattan gave some tigures that are interesting in connection with the heavy traffic under his charge

the average weight which the Man-hattan engineers have found was imposed on these streets is from 190 to 200 tons for each square foot of surface on moder atoly used highways such is Spring and Worth Streets the Bowery and Central Park West On such stricts as Chain-bus (anal Hudson and Lafayette the weight is from 200 to 300 tons and on the more congested thoroughfures. West, South and Delanty streets and parts of Eighth Avenue the load averages from 100 to 400 tons. At some periods of the

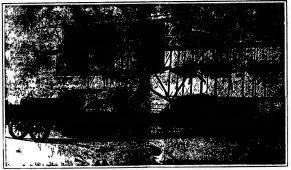
tion is laid to a depth of six inches, and the average breakage or eaving in has increased slowly in the last five years, having been 5/100 of one per cent in 1913 8/100 of one per cent in 1917, and 12/100 if one per cent in 1918

The anunal cost at present to restore the annual cost at present to restore the caved in sections is about \$30,000, Mr Pin kiny explained. The highway department has considered the advisability of mixing the concrete depths. thicker but to do this it was found that the mittal cost would range from \$100 000 to \$200 000 and solely as a matter of economy the city authorities have decimed it wiser to repair the breaks at \$40,000 over a path eight feet wide and travels at the rate of four to aix miles per hour. The slower speed is used in congested districts or when there is considerable refuse to be removed, the higher speed in residential districts where there dirt and where the streets are apt to be It is said that this machine has a canacity of 50 miles of pavement, eight feet wide in eight hours and the cost of accomplishing this work is about \$3

The engine is rated at 45 horse and drives the front wheels, which are of extra wide tread and are used only as tractive members. Steering is accom-plished by the single rear wheel which is mounted in a special fork construction As the machine runs on three wheels, it can turn around in a very small circle The broom and elevating mechanism engine has four cylinders with a bore of 424 inches and delivers its rated horse-power at 15k0 revolutions per minute The transmission system includes a 50 horse-power clutch, a three speed selective sliding gearest with differential included in the same case or housing in which the broom and conveyor shaft gears operate. The broom and elevator have two speeds independent of that of the machine. The broom has a diameter of 34 inches when new and can be worn down to a diameter of 21 inches before it clases to be effective

The water tank may be filled from any convenient hydrant once or twice an hour and the distribution can be regulated by varying the air pressure which forces

the water through the me conveniently to the driver seat The sweepings are held by a hopper which has a capacity of about three cubic yards, which is said to permit an hour s run under average conditions and can be easily emptied when filled by a dumping lever at the driver's feet The dirt conveyor is a revolving belt, extending the full width of the broom. The cost of cleaning has been reduced from 33 cents per 1,000 square yards to 12 cents by the use of this machine



A tractor-truck haufing a big scapiane to its hangar

day for a period of eight hours, West Street accepted on eight money, while the lasy section of Fifth Avenue, north of 23d Street accepted 550 tons in Winter dropping to about 250 tons in Summer

The engineers, and Mr Pinckney, is making the problem of producing strong foundations for the road surface a most senious one. Of the three types of foundation material namely concrete, old stone pavement and macadam, con-Borough has 154 miles of road surface laid on concrete 101 miles on stone and the road problem of New York is rendered all the more difficult, Mr Prockney pointed out, from the fact that about 150 000 square yards of road surface is torn up every year for repairs to conduit systems beneath the roadways

#### Power Street Sweeper

Till authorities of Boise City, Idaho, use power street sweeping machines of special design that are each capable of dong the work of three animal drawn outfits and corresponding gangs of work-men for operating and removing the sweepings This is a gasoline engine driven street cleaning mechanism that sprinkles, sweeps and collects the refuse

#### Hauling"Kosher" Meats by Motor Truck

A RATHER unusual, but no loss practical use of the motor truck is the solution of a perplexing problem in meat delivery "I his con-sists of hauling "kosher" meat from the abattours in Philadelphia to the Jewash markets of New York's down-town districts There is need

for haste in this work because the meat must be delivered to the retailer within twelve hours after it leaves the butcher's hands as the religious rule is that it must be eaten within twenty-four hours of the killing to be strictly "kosher' The truck running time between Philadelphia and New York is 10 hours so it will be evident it takes some speed to make deliveries to the "kosher' butcher shops in the 12-hour period Great reliability truck operation is called for and strice adherence to schedule as it would not do to have the meat turn from "kosher" to that of "trefa" because of delay. which latter condition renders the ment unsalable to the Jewish trade



ingly when you look for that Triangle B. Several thousand men have worked

fifty years to make it worth looking for.

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\$4.00 \$4.50 \$5.00 \$6.00 \$7.00 \$ \$8.00

If you have been paying \$10.00 to \$12.00 for fine been, a tral will convince you that for style, comfort and service W.L. Douglas \$7.00 and \$8.00 shoes are equally as good and will give excellent saturfaction. The actual value is determined and the retail price faced at the factory before W.L. Douglas name and the retail price is stamped on the bottom. The stamped price is W.L. Douglas personal guar-

antee that the shoes are always worth the price 313,504 paid for them. The retail prices are the same everywhere. They cost no more in San Francisco than they do in New York.

Cost no more in San Francisco than they do in New 3. Stamping the price on every pair of shoes as a protection against high prices and unreasonable profits is only one example of the constant endiavor of W.L.Douglas to protect his cautomers. If a quality of W. Douglas product is guranteed by more than 40 years experience is making fine shoes. The smart styles are the leaders in the fashion centers of America. They are made in a well-oquipped factory at Brockton, Mans., by the highest paid, skilled shoemakers under the direction and supervision of experienced men, all working with an honoset determination to make the best shoes for the price that money can buy.

CAUTION—Before you buy be sure W L.Douglas name and the retail price is stamped on the bottom and the inside top facing. If the stamped price has been mutilated, B E W A RE OF FRAUD.



# Real People

THAT'S what the doughboys called The Salvation Army workers on the battle-fields and back of the lines in France

They were 'real people' to the soldier, because they were just like the folks back home with hands accustomed to work and eves always ready to smile

And now these same 'real people' back from the war with new laurels have built their trenches in the Streets of Poverty in America They well wage the fight for the poor and unfortunate at home just as they have done for years, only on a larger scale. The Salvation Army conducts Reacue Homes—Day Nureries—Homes for the Helpless Aged Lodging Houses for the Down and Outers—Fresh Air Farms—Free Chines.

It must extend this service everywhere where Misery and Poverty exist. It must continue to reach down and lift up the men, women and children who have fallen

## Will You Help?

THE SALVATION ARMY HOME SERVICE FUND MAY 19 TO 26

## The Service of the Chemist

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Conducted by H. E HOWE Chemical Business

#### War Credits

In those days when we hear so much of what the war has cost it may serve some useful purpose if we set down in a gentral way a few of the things we seem to have gained. We refer to some of the gains which are of importance although secondary to the principles which have been sustained political upbesvals and gorgraphical boundary changes.

Regarding and the property of the second bear fails in prints on scientific advancement and mechanical development. War is a time of great simulation in many directions and new nituations call for great invariant. We one evidet to war for the inception of the sugar-from-bests industry for it was only when the importance of an engar from the usual sources was cut off during the Napoleonic wars that I rance looked to the sugar best. It was then inferior in sugar context and purity to the roots now used and developed of work, has been done to increase the practicage of the sugar in the best recovered in the factories. A little while lefors the war sugar boots were furnishing about 60 pir cent of the world a supply So far as America is concerned the European war wrought several changes in the same industry giving rise to the production of sugar bet seed in the United States the prifection of best sheing kniese for the singer factories and the recovery of potable from the waste best molasses, also in which might have the Makes placed in the unique of the way to be the production of the sugar factories and the recovery of potable from the waste best molasses, also in which might have the Makes placed in the unique that we want to be supplied to the might have the supplied in the supplied to the supplied

press;
The I ablanc soda process whereby soda
ash is made from sait also originated in war
accessely and so perfect was the chamistry
of the method as originally devised that it
method as originally devised that it
becomes the control of the control of the
more without fundamental change. Its
byproducts, hydrochloric acid and bleaching powder, have made it possible to continuity of the competitor—the ammonia or
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rand the process—made it possible for its
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and chlor form as anesthetics, following
which there has been a long ine of experimints each designed to benefit the patient
while increasing the opportunity for surgery
to be come completely successful. The
corronous businesses was greatly advanced
and the product introduced by the Civil
War

#### Science and the War

The Furopean War may be credited with having awakened what bude fair to become a red interest in a stentific and industrial as a red interest in a stentific near discovery of a few amentific facts and their practical application have a greater bearing up in the world's future than most of the phites that seem so important to many Prinags we may be coming into a chemical and engineering age in which friendly instinus will work in closer cooperation than ever boffer. In July, 1915, Great Britain established the Council for Scientific and Industrial Research, ancee which time as large number of researches of industrial importance have been conducted funds have here provided for student continuity to the contraction of the provided funds have here provided for student or similar lines of manufacture and a great million-pound fund setablished by the government from which, under certain restrictions, pound for pound, may be contributed to those associations, conducting approved studies Canada, Australia New Zealand, South Africa and Tladia have followed closely after the

mother country in organising councils white smaller subdivisions of the British Empire are preparing to make the mest of research

In our own sountry the National Research Council was established in 1976 sunder the amprices of the National Australy of Stomess and after valuable service both before and during the war, is planting an ambitum program for contrased institutes. Steps have been taken to join an ambitum program for contrased institutes in certain phases of research work and much of real benefit to midsarry may be confidently expected Manning to the contrast of 
#### Development of Invention

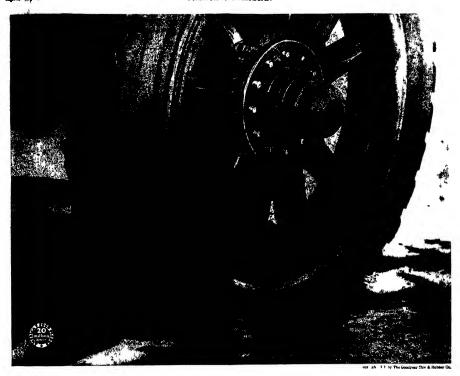
Closely allied with research has been the trials which new inventions and processes received years ahead of their normal time Several things thought impossible have been found to work and our ideas of what is impossible have changed materially Processes which private concerns for one or another reason might not have considered, have been demonstrated under government control, and we have as a result, such romarkable performances as those of the helium plants in Texas. Without the great demand for nectone in smokeless powder manufacture it magit have been vears before a large plant would have worked out the bechnque of producing worked out the bechnque of producing worked out the bechnque of producing considerations of the control of the control of the control of the work of the development of the synthetic method

#### Development of Our Natural Resource

We have taken a new interest in our national resources, too We know that radium bearing ores are to be found within our border and are not confined to Germany and Austria. Indeed we are informed that much of the rin' European' ore was carried there from Colorado The Bureau of Minnes with the coloperation of certain public minded citizens soon remarked the matter and established the remarked to the remarked that the coloperation of certain public matter and manageness have been produced in abundance our magnesite has proven its worth and from American clays the glass pot makers have fashioned satisfactory pole, heretofore only made with the help of imported materials. The search has been for specific recourses and funds have been available for necessary preliminary work while the emergency under which we found correctives.

More consecuently we have learned that More para a mumeral from which primare and to the control of the control

(Constitued on page 46)



GOODYEAR Pneumatic Cord Truck Tires are not only helping our trucks to last longer but they are lasting remarkably long themselves We find that their strength properly conserved, means exceptional mileage "-G N Burg for M Burg & Sons, St Paul, Minn

A SET of Goodyear Pneumatic Cord Truck Tires has averaged 22 450 miles per tire on a motor truck owned by these wholesale furniture merchants. The odometer already had checked off 20,000 miles before the first two tires were replaced while the third reached 22,450 and the fourth ran past 27 800

Of course, mileages of 15 000 to 25,000 are seldom ob tained where tires are abused or neglected. This particular record reflects reasonable care given these tires. Nevertheless they made their good scores despite being obliged frequently to carry full loads over bad railroad crossings and through unpawed and littered streets.

The company recently announced that Goodyear Pneumatic Cord Truck Tires have replaced solid tires on all their trucks. This is both because of the endurance of the big Goodyear Cords and the fact that they have minimized mechanical trouble lessened breakages in furniture covered more ground eliminated wintertime delays and reduced fuel and oil consumption.

Therefore this user like many others has benefited very delimitely fix in each of the pronounced virtues of G (dwear Pneu) and Cord Truck Tires—namely, their toughness traction, cushioning and wider radius of action

THE GOODYEAR TIRE & RUBBIR COMPANY AKRON OHIO





XVE weave the cool B V D Nainsook in our own mills especially equipped to make this fabric The cotton used is particularly selected

for its quality and strength This insures to you, the wearer that superiority and economy only obtainable in B V D Underwear B V D Coat Cut Undershirts and Knee Length Drawers \$1.00 the Garment B V D Sleeveless Closed Crotch Union Suits (Pat U S A ) \$1 75 the Suit THE B V D. COMPANY, NIW YORK /t pent BVD. If it <u>hasnt</u> this Red Woven Lab B.V.D. BEST RETAIL TRADE 

Published Dec. 2, 1918

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#### War Credits

(Continued fr m page 466)

know that they can be, and we welcome these valuable new additions to the class of scientific instruments upon which so much ends in industrial progress

Bondes discovering some raw materials and making various intermediates we have found that the American mechanic is capalle of meeting any emergency and war much it micessary for many thousands to acquire skill which might never have been realized otherwise. Our marloquets in lirge numbers became accustomed to working within extremely small limits with pression of our work should be much greater Quantity production has always been the American specialty to which we may new add a higher order of workman-

#### Chemical Independence

rapidity and completeness with which we have provided ourselves with key industries must give the Gorman captain of industry the blucs whenever mentioned flow long and furthfully the Corman scientist and manufacturer worked to convince us that we lacked raw materials bud months sent technical skill and were without the ability to organize and manage such industries! I oday we have a chemiheavy chemicals in which we have always been strong many organic pharmaceutical near strong many organic pharmaceutical and swith the bodies which result from risear h f the first order. How long we should have had to writ for such independent but for the war, no one knows I did we have our own chemical glassware and p ralam stoneware and fused We are refining our own rare metals and where is very little if any optical glass wis ji duced before 1914 we are today in a p sitim to export that essential comm lety. Our dye industry has risen from a min r cille tion of assembling plants and those working from imported intermediates te i ging concern with some three hundred millions invested having ac-implished this development under the must trying conditions as regards labor and raw uniterials some of which simply could not be had while then was need of exof service

He w would you like to he ar the Chemical of Carmin goods into our market and to priter those American manufacturers who are hensed by it to work under these account I German potents. Thus through one f the most constructive pieces of work the with has brought out the very German pitents designed to protect (erman interests against all comers in our market, tees agents all comits in our market, been set flexive defence in American hands of our new industry!

Ans surplus carnings of the Toundation and evaporated milk so the European war after the preferred stock is retired will be

introgen has received onathrespheric introgen has received as advantage of saving about 80 per cent in coursaginust in our country in a measure volume and 90 per cent in weight besides which only a war extreme necessity spoilage (16, over our present methods could impart. The synthetic process.) And where chammetry, physics, mechanisms and the saving of the spoilage (16, over our present methods could be another than a severity-five necessary spoilage (16, over our present methods while more than exercity-five nellions have while more than exercity-five nellions have been invested in plants operating by two or readed as a war device, and applied in the methods By-product coke oversight of the methods By-product coke oversight of the methods by-product coke oversight of the method of the methods. gaining on the wasteful bechive In 1917

the beshives gave us 83,107,548 sons of coke and 80,406,000 in 1918, while it 1917 the by-product overse produced 22,204,000 in 1918. The gran has and 28,204,000 in 1918. The gran has has shown the economy of stripping as

And what of our infant potash industry? True fumes and dust were being precipi-tated from cement mill flues in order to protect surrounding vegetation, but it has taken the war to encourage a spread of the practice and to arouse interest in making potash a valuable by-product of blast maximum production so that in future the furnace operations winning it from signific and developing by-products from kelp, which may make it possible for the potsab-from-kelp industry to survive in normal

> In Germany cellulose chemistry must have made great strides for wood consti-tuted about the only source of this building material of nature, the form of which has always excreed such an influence upon envilration in each locality Explosives from wood in place of cotton paper tex-tiles, wider use of hard fiber—all go back to the chi mistry of cellulose. Here, to con-serve fats, we learned how to make glycerme by the fermentation of glucose or starches the end products being alcohol and glycerine and the cheap process seems to have come to stay It required a war to fully quicken such inventive genus

### War Gases and Peace Industri

The war led to a real study of gases and now we know something of their use, control production and how to handle them with safety. This will lead to better protection in mine rescue work, in fire fighting and in applying disinfecting measures. There should be less danger in handling ammonia where a concentration of 4 per cent in the air soon produces a burning of the skin. We have throughout the country more men who know something of gas technique and can act as new centers of information. Then we have made the acquaintance of new gases which seem to have commercial possibilities. These gases are available in quantity for experiments and that always means new uses Thus phosgene which used to cost about \$1.50 may now be had at say 10 cents at which figure it becomes attractive for such uses It is will'd you like to last the Chemical figure it becomes attractive for such uses cloud-time in the discussed in Germany? I as the removal of iron from sand wanted it is expected that this Loundation the for optical glass. Phosgene (earbony) as k f whi is is distributed unough the charged wherean companies and to it removes the outdeep year form thoride with is oun 1500 enemy patient have been as the course of the proposed of the proposed from channel at 1 with hashe to prevail the dumping I von small traces of tron cannot be prevailed to the course of the proposed from the proposed of the course of the cou greenish color iron imparts and this method for its climination seems promising
It is also barely possible that some

may be useful against rodents and the like, their disappearance from the trenches being one of the few blessings of a gas attack

has introduced dry milk to many although after the preferred wtork is retirred will be line introduced dry milk to many although divited to research thus greatly strongths the howing once have been using it for sening the very industries the German lyers. Properly dried milk is easily soluted that I he war is surely responsible for such that I he war is surely responsible for such milk the lactone the protein and as much Frantion of Atmospheric Nitrogen.

A new process for the production of promise and a rapidly approaching necessarily to the provider with the proposed of great variety of these major and a surely of the proposed of great variety of these major and a sequely of the proposed of great variety of these major and a sequely of the proposed of great variety of these major and a sequely of the proposed of great variety of these major and a sequely of the proposed of great variety of these major and a sequely of the proposed of great variety o A new process for the production of promise and a rapidly approaching neces-vanide upon which chemical so many sity for the majority of those in densely mining pixting desaming and hardening populated areas. Dehydrated vegetables, much als depend has experient id commer-cial development while the fixation of aided by war and we may soon learn the many as yet imperfect, are also upon us nided by war and we may soon learn the advantage of saving about 80 per cent

(Continued on page \$15)

# The Hartford's Greatest Service is the Prevention of Fires

A policy in the Hartford Fire Insurance Company means to a large degree insurance against fire. Insurance against fire is a very different thing from fire insurance.

Naturally you want both. You do not want a fire at all if it can be avoided. If you do have a fire, you want the insurance money paid promptly and fully. The Hartford doesn't want a customer who does not consider a fire a great calamity, even when fully insured. It wants to insure only the man who takes out fire insurance as a preparation for the worst, and who will cooperate with the company and its agents in keeping the worst from happening.

When we write a policy of insurance on a property, we reserve the right to examine every element that affects the risk.

One essential element is the character of the insured. The character plays a large part in insurance, just as it does in banking.

Our care in selecting risks—our careful consideration of the hazards involved—our co-operation with the insured in preventing a fire—constitute the most important service the Hartford renders—more important even than the payment of losses.

It is done in the interest of our policy holders because such a service protects the property owner from losses that his policy can never make good. The experience of our inspectors and agents is at your service to aid you in avoiding fires, just as the resources of the Company are at your service in fully and promptly paying any fire loss.

Any agent or broker can get you a policy in the



The Two Hartfords—the Hartford Fire Insurance Co. and the Hartford Accident & Indemnity Co. write practically every form of insurance except life.

HARTFORD FIRE INSURANCE CO
HARTFORD ACCIDENT AND INDEMNITY CO.
HARTford, Conn.

# Recently Patented Inventions

Brief Descriptions of Recently Patented Mechanical and Electrical Desi Tools Farming Implements, Etc

Partialing to Accounties

IIBII (NE GUIDINO AND BOME
DROIT INC APPELANCE—F & Havrassov
Hall will Kans The investion relates to an
appliance sharely an observe con communicate
to bis it (1) an indicating divide the manner of
g iting the signature for bounding or photon splints g tims the airplane for bombing or photographing any target or other satested piace the appearatus in I dring a telescope sight which the observer maintains on the larget and thereby operates an in II aims devices which is conveniently postformed to the I liot so that he may steer the airplane in

#### Electrical Bevises

PUSE G DENMAN and F F Lawis 228
So 14th St Terre Haute Ind This invention relates to electrical fuses and has for its object to provide a fuse consisting of a primary and auxiliary



FURE

primary fise is burned out the current will be autorisal ally transferred to the secondary auxilia's fuse without any interruption to the

A STATE OF THE ASSESSMENT OF THE PART OF T

## Of Interest to Farmers

11 INCOME A P M KINIET CARE
of Inty raity of Mahama Ala. The invention
has f is lict the provision of a device especially design in the interally d wign. I for inervesting possitis and the like with a supporting frame is provided having MAGHINES

Corles Esques Brown THE BRIDGEPORT CHAIN CO.

The VILTER BRIDGEPORT CHAIN CHA

DINA—H (a Sittuer 410 Geneva Ave Highland Park Mich. The invention has for its object to provide a deak especially adapted for new with stenographers and typists. The deak consists of a lody portion and wings extending rearwards and outwardly the rear edges of the



PERSON CIVE VIEW OF THE PERS LOCA FROM THE PROPER

ody forming a continuous co and the front edges meeting at equal obtains angles one of the wings having a depressed table for receiving a typewriting machine the top of the wing adjacent being fixed while the tops of the other wing and body are hinged to open

bottle A more specific object in the provision of a seal having a basel two sets of arms seal down nocks commercing the arms and the basel shall see set of arms so that the parts may be proquel folior to ver the bottle basel be stopper of the position of the stopper IABS WALKER - N. Noza. Sa Dubois, Pe

BADY WALKER - N Noat Su Dukton, No The invention has for fits objects to provide a baby walker in whith the baby may travel based and forth longitudinally of the structure for which purpose there is provided an elevated floor inguither with a spring-suppointed such disposed above the floor and carried by a sittle adapted in travel back and forth. The structure is in based: down form. The frame at the ends in tables for the baby to either feed or play at

PROCESS OF MAKING ORNAMENTS PROCESS OF MAKING ORNAMINTS—
R Farrs are 844E 164th its Broxx, N Y The
object of the invention is to provide a construction
and process whereby a substantially mon-finglic
ornament may be provine of far use as a discreasion
on a C infrastructure are orn on clothing. A further
object is the utilization of a method whereby
holium numbers may be formed from motion gives
and then inflated to the desired size and coasie
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WINDOW FLOWER BOX—A E HUMEN, 455 W 119th St. New York N Y The inven-tion relates to window boxes for flowers allowing for the maximum of air and light in the interior for the maximum of alt and light in the interior of the room to provide for a sufficient depth of soil for the plants to construct the boxes in such mannor as to review the soil directly or to receive lineart soil containers and to provide sequential united in order to actapt the house to windows of different widths to provide suitable deviations on the containing the containing the containing the containing the containing the containing soil different widths to provide suitable deviatings and means for anothering the box in place.

BUITTON -C P STONE 40 Ruthard Sq. Boston, Mass. An object of the lot sention is the provision of a construction which may be quickly applied and will remain firmly in place. Another object is to provide a button which may be soliced to articles of clork without the use of throads

DIRTORTION DEVICE FOR ATTACH-MENT TO CAMBERS AND SIMILAR AP PARATUR—I SERIE case of William M York N 3. The object of the invention is to provide a distortion device for attachment to the objective of a photographic cancers projecting appearum and stimilar appearatum arranged to permit the user to take or project as distorted platter of the property of the project as distorted platter of the platter of t the control of the operato

#### Hardware and To

CORE REMOVING TOOL -- B E CREAMEN COME MANOVINI TOUL — R Vashasy Ranford M. Among the objects of tile move tion are to provide means for renoving the core from fluid of certain characters such as graga-ficult or other circums products to perform the operation with departs and nestness to reduce the most for handling the fluid and consequently colleg the, shade and to produce a tool of the ter mentioned at a low co-

MEANS FOR LUBRICATING MACHINE MEANS FOR LUBRICATING MACRINE TOOLAS—W F McCaptr oer of Definese Machine Works Defines that The invention relates to the luber-aits or disachine tools such, for instance as horizontal boring drilling milling and staperfin machines. The object is to growthe passens for lubricating the hearings genera and citterian consistent in the vertilest adjustable head of a machine tool the arrangements bring such as to fineurs a continuous lubricating of the practice as to fineurs a continuous lubricating of the practice and patients of the machine to the machine tool the arrangements bring such as to fineurs a continuous lubricating of the practice.

Section and the sections of the sections of the section and sections of the section is to provide a store or range having a plushity of independent of the section of the s

CAR HEATER—E P Corn, onre of Cole
Mix Co Chicago III The object of the invention is to provide a store adapted to use eliber China is Co. 587 W 17th it. Mere York. N

China is Co. 587 W 17th it. Mere York. N

The object of the invention is to provide a construction which will positively seal the cork and provided in a construction which will positively seal the cork and provided in an expension of the construction which will positively seal the cork and provided in an expension of the cork that is sealing to the cork and provided in the cork and expension of the cork that is continued to the cork t



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Bridgeport, Conn.

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Accordance and dischanded Baylone.

Listellation ALCHINE—0 S KI state of a control of the 
cleanests of time and labor

CAMPY COAINO MACHINE —P P

PUBLIA Bradley Beach N J This invention
relates to candy making machines and mure
particularly to a machine for coating candy center
with chocotiac or other coating material Togeneral objects are to provide a machine which is
deed to dispect and to provide a machine which is
dispected to object are to provide a machine which is
dispected to object are to provide a machine which is of large capat thy which is primarily a cauch conter consists machine and is adapted to receive cauchy conters from a midding and casting machine and includes means whereby the candy centers are experted from the molding mate ial and fed to the coating mechanism

OCMPRESSOR—R ROLERER care of Shorwood Apts 451 S Grand St Los Angeles Cal Among the principal objects of the invention is to Agong the principal objects the hierarchies to increase the power of compression in a machine to provide a compressor comprising a plurality of helical members of different diameters the convolutions whereof are interfeaved and means for maintaining the convolutions in line to interrups chambers formed by said helical members mid means embodying an enfolding easing and s for rotating the helical members in unison

means for rotating the helical members in unknon NON-MERTALICLE NOUNEN, PRITON—Q B score: 100 E 
Massianal Beveloes

PIANO—P M Bonax Export Sales Dept
Western Electric Co 100 Brandway New York
N Y This travellocia for five dollect to provide
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chapter surface of the long of the plano. Another
chapter surface to over the lexys and a top which
may be opened to say desired extent from a small
to a compile thating of the boy plector share; the

Prime Movers and Their Accessories
AIR HEATING AND REGULATING
MEANS FOR INTERNAL-COMBISTION
ENGINES—11 BROOKS BOX 716 El Jaco
Texas The invention relates to an air heater Tessas The invention relates to an air leasers to be applied to an internal combustion onstine for utilizing the heat generated in the operation of the engines and supplying the heated air to the earhuneour to produce the fuel insister A motion also is to automatically compensate the calling affect of cold jas let water by an increased temperature of the intake free of the internal compensation of the internal compensation of the internal compensation of the intake free.

ted key is required to operate the looking

Perialadag to Recreation
SINKABLE TOY SHIP — I B BAS KREAR I
IS Hord S Hondoulth. Territory of Hawall
The invention relates to toy slight having means
whereby to classe submersector by sentiating water
targets the inits of water being concluded by
provide to the control of the control of the control
provide for relates of the value means by the
bitting of a sarget which simulates a hoas avenue
is support agreemedly supported of davite The bitting of a target which similates a reas swing in supports generally suggestive of davits. The invention also provides a trigger engageable with the target so arranged that the acting of the trigger permits she valve to automatically close for maintaining the ship in floatable condition

#### Pertaining to Volticies

BAPFET LOCKINO DEVICE FOR VERI-CLESS — E N. MOOREN, 1001. COURT SE. Porte-mounts V. The leveration relates to autoco-biles, autoc-trookes, airphase and similar vehicles using internal combustion entenies at the motive power. As objects to provide a safety locking deviate to previous provide a safety locking deviate to previous motion and to sound an safety between see unsuitational previous tempora-tions and respirate the motion and to sound an safety between see unsuitational previous tempora-

THEROCK PRF.—D. F Ourres. Derid. Still Sten St. R. Ontched. Chi. The officer of this Standard is in growth a value to me treet appear-

TRACTOR AFTACHMENT FOR ALTO
MOBILES M I ADAMS 910 Memart %
Seattle Wash The prime object of the invention
is to provide a particular atta human for applicais to provide a particular atta liminst for applica-tion to an automobile in place of the roar wheels whereby to drive the automobile over anow and tee with the front which supported on show or stells or to prope! the automobile on middly sandy or similar roads

DIFFERNIAI (H Brown care of Brown Welding to El last Fexas The la wortion r lates to differ utilisis for motor vehicles its object is to provide a device, wheelin the set tions of the axie are connected by a worm general sections of the axie are connected by a worm ges-to permit a slow differential movement without under resistance while turning a corner for instance but which will prevent the axie sections from turning readily with respect to each other

From turning readily with respect to each other WHRI I BMM F F Taxtuo tear of Prospical Lumber to Bolen N M. The object of the invertion is to provide a whose iron more especially designed for use on wheels of automobiles autoravia and similar power-driven vehicles and arranged to permit the operator to queltly red lapse the rim for placing a tire in position or removing it thereform whenever desired

SHORT TURNING OF AR FOR PRAILERS A Aux - Turin Italy The investion has for its object to provide a device-which can be applied to four wheel cars of the usal type that is having a fixed rear sait and a front sale rotating as to the car for the purpose of making the said car when used as a trailer to travel exactly in the track of the tractor

TIRE CANNO — ( W Minage 517 Bergen
Ave Jersey (ity N Y An object of the in
contion is to provide a tire casing of purature and
blow-out resistance and heat minimization blow-out resistance and heat minimize Another object is to provide a casing form inner and outer sections—xcept along the



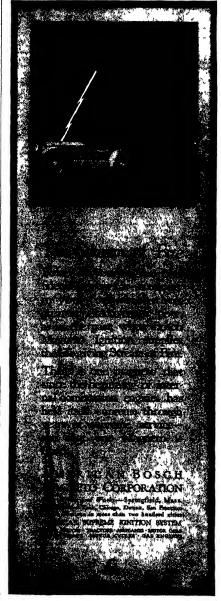
TIRF ARINI

adjacent the base of the asing where they merge to firm the clencher beads whirely to define a space between the section I which powdered graphite or other dry labric it is received and to provide armor means for the cosing

SPEED MEASURING AND CONTROL ING DEVICE—J H C mp HI blath Ave Nashville Team The present invention relates generally to a device for measuring speed and controlling speed of vehicles more particularly to controlling speed of venicles in Fe particularly to improvements upon patents No 1 110 900 granted to the same inventor the object being to provide a more simple generally effective construction

a more sample generally electives content to MOTOR VISIT LE A R. Carran Ham mond La. This invention relates to vehicles of the steam drives type below such raw whose is commercial directly with a pair of redfproating platons and wherein a holier is provided for exp-pitions steam to the platons the supply below connected by the electric of the vehicle to enable a differential to be dispensed with

a differentials to be disponsed with LIGHT REFI KCTING RAND SIGNAL— O B MULLAW Biell Are ness Proceeding Nay of the Committee of the Committee of the Committee of signal device that is subject to be worn on the based of a driver of an automobile or other whiche The object is to provide in light reflecting signal becomes illustrated from ray of light shallow there were not because of light shallow there were not to be a subject to the committee of light shallow there may be a subject to the committee of light shallow the order who has been light reflecting head signal.



## 412 DISSTO The Saws Used Exclusively by Many of the World's Largest Saw Mills the DISSTON Steel Works of a toughness strength and clusticity unsurpassed, low cost of lumber production and small repair bills are

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PUBLISHED APRIL 1, 1919

## HOME MADE BEVERAGES

NON-ALCOHOLIC BEVERAGES 1120 Formulas



**ALCOHOLIC** BEVERAGES 234 Pages

\$1.25 Net. By Mail \$1.30. West of Chicago \$1.35 By ALBERT A. HOPKINS

EXTRACT fr in the Preface Without holding a brief for either the pro-hibits used reft so who wish to manufacture innocuous beverages at home the lattle 1 is officed in the lattle in that it classes forced in the re-action of the results of the lattle from the lattle forced in the re-ractions wine that in a 1

Book is attra to by and being all want this book. The probab-tionate like the brider is. I task beying beverages which can be under at-home and the three want fruils which d not require allia or other past pihernalis of the distillers. It however, The information contained will be of interests to all.

SCIENTIFIC AMERICAN PUBLISHING CO.

233 Broadway, Woelworth Building

New York City

On the relieved readily from pressure it to the relieved readily from pressure it is to the received for the purpose of winding or which is expected on the in districts.

METHOD AN OF ADVANTUS FOR CLEAN METHOD AND APPARATUS FOR CLEAN to the winding when which which will permit the device to the resident the winding when which which which when the resident for a working of the keviling wheel being accomplished in the resident of a working of the keviling wheel being accomplished in the resident of the traver. A further onby it is to respect the amplies of the view has able to be directled.

IRACION DRIVE W Press Box 266
Cland New Mexico The invention relates to a
fict in drive more particularly intended for
cuboding in a tractor of the View per period object
to Lirvide a drive means involving filetion is to Jr vice a crive mean involving irrano-jiikin and friction diaks to be engaged throby-and in which as offective driving engagement is instued lectween the philons and the engaged is a and means controlling the philons to vary the sucod or to reverse

HARNESTER A R MILLER Decision lows this invention relates to grain harvasters a time for its object to provide means in con-nectin with the draper of a bimier or other harvasters which receives the cut grain from the sike) for a tearling the headed ends of the straw f a locating the even placing of the cut grain of the draper

MOTOR PLOW -- K ALCHARARI BOX 586 Thurber lexas l'he prime object of this in centi n is the provisi n of a plow provided with a spring actuated motor driving device the latte spaling actuated motor dixing device the latic being a wound for use by the land of the operator stations to whap the driver a seal. A further of jet is 1 provide a piow having a plurality of mach beards and procked with an inexpensive motor means eliminating the use of draft animals where the most provided with an inexpensive strictly the matrix power will be without cost a single operator completely manipulating the device

#### Of General Interest

HAIRWELL HAM HENDER THE HUMBOUSE HOUSENER N. J. Among the principal objects which the invention has in view are to provide want in incremental make in view are to provide an article tentricular of matal adapted to he hung from the ordinary picture moldings pro-vided in houses the device may be readily dis-manifed and packed within amail compass and is adapted for service at different heights.

adapts of on write at different heights ATTACHING 90% KPT FOR GAS IT BING IR  $K \in \mathbb{N}$  Laws 178 Kemass 88 Brooklyn  $N \in \mathbb{N}$  be object to the struction is to provide an attacking access for tubing arranged to provent the class. Tubing the properties of the state bine section for the class in tubing a care for me arabitably aligning or being pulled off from a radiotably aligning or being pulled off from the gas aligniple than pix wenting nearys of the gas. Another object is no reinflowe, the shault off that the first provide the province of the control tul tiar tip to prevent the same from becoming

ILISH TANK VALVE -- K R HILL NEW HARN TANK VALVE — R. R. HILL Now Minan). Mise This invention which relates to flush tank apparatus. The particular reference to the automate valves for controlling the false supply lipse of such don'to: the freezion con-ception of the supply lipse of such don'to: the structure covered structure an improvement on the structure covered by Palentt No. 1 267 241 Instend to the same inventor Formary 19th 1018.

Investor Fubrary 19th 1918

BULLDING OR CASTING OF SPEEL

CONR REFF SHIPS—N & FOUDERS Chief

Links Norway The investion relates to the

London of sized control ships of middle size

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CAN I FEN HOI DER—G. C. WEI TER BOX 5 R swed! N. M. The invention relates particularly to means for strapping the canteen to a support in object of the invention is to provide a simple at I inexpensive holder which will retain the can CAN I FRN HOLDER -- G C WRITER BOY 5 f the canteen during the motion of the body by which the support is carried

by which his support is carried with WATER/ROOP CROWN YOR WATE HES WATER/ROOP CROWN YOR WATER HES AND TO A WATER HES WATER/ROOP CROWN YOR WATER HES WATER HE WATER HES WATER HE WATER HES WATER HE WATER HES WATER HE WATER

WATCH—M J GOLDEN GAS 8t Marks Ave Brooklyn N Y The object of the invention is to provide means for sealing as watch against the pen trailon of moissure about the winding and setting arbor Provision is rander whereby the arbor can be sealed under sufficient pressure to abcoluted prevent the admission of water. but

tumbling and scraping action to the trips dur such course and carrying off by floatsten transous matter freed from the trips, the wy being done mechanically instead of by hand

FOLDING (O1—J LUPPING 1668 85th St Brooklyn N Y The invention relates to furniture its object is to provide a folding cot which can be readily folded to take up vary little which can be readily folded to take up way lived recent for storing shipping or other purposes or which can be extended without much physical exerction on the part of the operator the oot when in extended position having its parts securely locked to prevent accidental folding COLLAR BAR — 8 Sameson 2 E 23d St

COLLAR HAR—8 Nameson 2 E 28th Rt. New York N Y Among the principal objects of the invention are to provide simple means for preventing failure of the meeting ends of a collar to bold the colla finally to avoid marring the exposed surfaces of the collar where it is gripped by the bar and to provide means for holding a necktie in proper position

necktich proper position
HOLLOW (OINFE BLOCK—F Havra
1001 McCormick Bilg Obleago III The in
vention relative to hollow corner blocks for use in
hollow wall ronstruction. An object is to form
a block for constructing corner of walls jambs
of openings and for building piers which will
inake a more sightly corner Each blocks in common use and will give a pressure steeping whee
boult in a wall than ordinary corner blocks go.

POWDER CONTAINER -O E ANDRESO PUWDER CONTAINER—O E Arcusseous Ja 486 Commercial St. Ascrota. One The Invention relates more particularly to a dispensing container for various uses the edipter possing container for various uses the edipter container. The property of the dispension operation may be accomplished reddly and quickly and a proper supply of powder ascendinct and travelly and active stands at all times to the device may be mounted in runner time with a wall bracket, and the like at any convenient point.

LADDER STAY -- J MARWELL 108 W 48d 8t New York N 1 care Elk Club The invention has for its object to provide a construc-tion of stay member capable of attachment to invention has two to dispect by provide a construction of state mental consistent of attachment to substantially any ladder and of adjustment to substantially any ladder and of adjustment to cocae with this lower end theoret to prevent siding. Another object is to provide a stay as formed as to be rotatably mentaled on one of the rungs when it is the supporting less of the sides of the faller.

COMBINED PIELD GLASS AND RANGE FINDER—B R lotty 128 Fayetteville St Raleigh N ( An object of the invention is to provide a combined field glass and range finder invoide a cottoblaced field glass and range finder which can be meet for one purpose or the cother or both and which those not take up any more room when folded than an ordinary telescope. A further object is to provide a field glass and range finder in which the range may be approximately determined by a single observer and a device of such form that it may be fished and stored away to support the control of the control o in the pocket

REINFORCING ELEMENT FOR CEMENT AND CONCRETE WORK -F G JORDAN 200 Indiana Ave Washington D C The invention relates particularly to a reinforcement for walls relates particularly to a reinforcement for walls and structures of control capable of effective effects (abriculture of control capable) and effective effects (abriculture and without the use of boils and other connections and without requiring particular tools or especial skill its extension therewish has object is to provide intervitions theretizous fix the tensest or concrete whereby to form a strong union and effective bond

BANITARY MILK MEASURE —W SMITH SN W Lincoln Ave Mount Vernon 1 This invention relates to measuring and dis ing devices for milk it has for an object the proing devices for milk it has for an object the pro-vision of a construction wherein an accurate quan ity may be quickly measured and dis-pensed at the same time. Another object is to provide a measuring device which may be hodily set into an ordinary milk can and operated quickly without impairing its accuracy.

COLLAPSIBLE LEAD PENCIL HOUSING COLLAPSHILL LEAD PENCIL HOUSTNG
—— REALEM 22% WORRS New York NY
An object of the invention is to purple a simple
construction which is obserced-rated by its significant
when the pencil housing is fully exceeded. The
housing comprises the sections, each formed of a
pair of spaced concentrate tubes tunted give a sent
at one set a lead grip associated with the setreams exciton such a such for expending the setreams exciton when the housing it collapsed.





material has to be conveyed, is such that other forms of transportation are impractical, the overhead Wire ramway comes into its own. It is aerial transport. ation in practical economical form.

Miles of Wire Rope Tramways were rigged up in the Italian Alps for the transportation of troops, food, clothing and munitions A line of communication was thus estab. lished which otherwise would have been

414

The line of communication between many a mine and railroad, logging camp and mill. is a Broderick & Bascom Aerial Wire Rope Tremway And many a Tremway of other manufactura la B & B Wire Rone equipped

This company builds Tramways of many types to meet various conditions, from the simple Two-Bucket or Jig-Back Type gravity operated, to the larger continuou Multiple Bucket Systems which can be installed for practically any length

B & B Wire Rope is made in every standard grade Our Yellow Strand is an axtra high grade rops of unusual strength. You can use B & B Wire Rope in your huameas

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HID IS 10 IN 1 F RETTER 214 E 24d St New York N Y This invention relates to a book point especially adapted for atthough not necessarily limited to book s taving flexible covers the general object is to provide a joint between the book and the cover sease to ma-terially strengthed the construction and in rates the flexibity of the joint so that there is loss strain the conditionally and closing the cover-

SUBMARINE DETECTOR OR TELLFALR — J. J. Francis All Grove SI, Jerses Cily N. J. A specific object of the invention is the providing of a front of mel which is detachably fast n. J. to unch ring devices so that when a ant me ine surface the net it can tear the latter away from the anchorage which then cause whate or telliah means to become operative so that patrol boxes can locate the position of the s through It the signals many miles away

MIASIRING DEVICE-F G Burrison to S of St. Ohma S Y The Invention loss for its it leet to provide a device wherein a swing ins, tank is provided adjustable for various

in the tank
IROCLES OF PRODUCING FFIRD
MANCANESI I T longs 420 Union Arade
Bidg Historigh is One of the main objects
of the invention is the provision of a process by mus of wide to for romanganese may b at a relatively low cost from low grade manganess at a relativity low cost from low grade manusanes ore. A further object is to justified a process while doe and require the use of specially de-signed as library but which may be carried out through the use of ordinary apparatus such as a regen rative coking oven and a generally efuringe. regen rative colong over and a generally efurinee.

MI HIGD NAD MFAN'S FOIL INDICAT
ING THE MAXIMI M FLAW OF PLATON
A LITTLY HANFAIRE IN N. W. Sadhington
D. C. The invention relates to maximum
domain to flow both atting melecis in which a
differential pressure due to the flow of a thial calls the displacement of a liquid a portion of wid it becomes entrapped in an hidealing tube the object I ding to provide an instrument which will make at the maximum rate of flow of a fluid such as water gas during any period of time

FINGER RING AND MOUNTING THERE FOR CIMN P I CAMBELL DOUGHA The object of this invention is to provide a FOR FOR Wyo The object of this invention is so provide a mounting adapted for use with precluse atoms or in correct relation while the atoms is firmly held against displacement and thus a minimum surface is the lowed and accordibility for cleaning and the like is had wherein the usual holding prougs for s are depended with

MAII BOX O Hovig 2728 Wellborn St Dates Texas. An object of the invention is to provide a rural mall buy of simple construction as well as her used accessed they for the convenient ins then and removal of the mail matter and to provid a signal pivoted on the cover of the to provide a situal pivoted on the cover of the box 1 log s (logable to approximately an upright position to indicate that n all is in the box

Hardware and Tools

FIGURE 100L—C L NEROLA Ravena wood W va Dis invention has for its object to p which noted to scalably adopted for permitting a d is held joint to be firmly connected with the remarker of the cadage in such manner that the nurse casing may be pulled without the neces-trial of electron the detailed joint until the said oint is withdrawn

AND ARC DIVIDING RULER -MILIGARE Elainore Cal The oldert of this vention is to provide a ruler which may be used to the ct any angle to construct equilateral trinsities and hoxagons to divide angles into two four or eight parts to construct squares octagons etc and for other purposes

VALVE ORINDING DEVICE - J C I ORRO VALUE ORINDING DEVICES - J C I owner 222 lilian o Rd, 4an Antonio Texas The inven-tion relates generally to valve granding devices and more particularly to an arrangement whereby the several valves of a multi-orithinder source on motor may be simultaneously ground, the object being the provision of a simple apparatus the

RECENTLY PATENTED INVENTIONS | attility repair and adjustment of the white | (Continued from page 412) | parts as well as ready attachment of the derise operative location

ADDING AND SUBTRACTING MA-CHINE—T J WAVAUMER, Shawano, Wis The object of the invention is to provide a calcuating machine so designed that additions subtractions can be performed by the same in the order of manipulating the in In adding or subtracting that is to say in addi a number more than ten the keys are operate from left to right and in subtracting a number to digits or more the keys are operated from right to

PROIT TRIMMING MACHINE - D T FIRMING HONOKORAN Mains Territory of Hawaii.
The invention relates to machines for the pesting
of pineapples. The invention is characterized by means to coact with the belt in pressing the pee means to coact with the best in pressuing the peed in proper form to the kills and by a form of correlation of the kills the best and the coaching pressor means with the purpose of firmly sustain ing the peel in position to be effectively utimized by the kills and with the purpose of removing the fruit from the peel to the maximum extent

GREASE CUP H E And 431 8 Dearbo St. Oak lark III. The liventhus is composed of a title, or rod with a countwo perforate top upon while the greax rists the lower end of the tube touches the shaft or axis of the mash line and a spaning core or plug rists in the smaller end of the cup a coll string is arranged within line the forcing the timb or rod down the action of the spring keeping the grosse soft and facilitating outck passage

ORAVIIA CONCENTRATOR - J BECOTT liox 503 Durango Col. The object of the invition is to provide a commentrator wherein a se of gravity concentrators is provided amanged to hold the concentrates in water in a narrow deep trough and having means for retarding the flow of the concentrates to permit them to settle by gravity and wherein mechanism is provided in connection with each trough for drawing off the minerals at a different level upon which they

#### Pertaining to Vehicles

BIABILISCOPE -B D WILLIE 264 Clinton safety appliances for use on or in connection with safety appliances his use on or in connection with automobiles or other load vehicles for the pur-pose of determining or indicating to the drives or other occupant the condition of safety of the road way or stallity of the conveyance while passing along roadways of doubtful or precarious aldo

when in lineation

HAND WHER! II W Doven Holyrood

Not thangton Pagiant! This invention relates
to inand when such as are omployed for severally
motor with his for operliang slop cocks controlling air raft unter boats gan men handam and
for other purposes and has for its object to
facilitate the assembling of the parts of the wheal
and to the apen the cost of construction

TAIL LIGHT HANGER -C F Tation, 157
W 16th Bl. New York N 1 Among the print challed the transfer which the invention has in view are to avoid in akage of lamps when liacking a to avoid in sage or amps with macking a volicle equipped therewith to provide means for contering the lamp by guiding it to its service position and to provide a yielding support for inrays (asving means for associating a Bonnes plate

AUTOMOBILE WINDOW -- W V DAVIS AUTOMOBILE WINDOW—W V Davis stee of Mace Edities to 6 4 dls. New York, N Y The principal objects of the invention are to afford opportunity for hand-signaling shills driving a cleard body automobile to prevent the admission of rain or smov to the laterior of the ran baving an opening in the 460 window for signaling purposes to avoid mosture deposit on interior of the visidow and to provide measure.

DESIGN FOR A PLAYING-CARD DESIGN FOR A RET OF PLAYING-CARDS AND DESIGN FOR A PACK OF PLAYING-CARDS—A Gringwait Fayetteville Team This invention has been granted patents on the three designs as mentioned above

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## PATENTS

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#### War Credits (Continued from page 408)

is making good But vesterday the Ger-mans were trying to capture the mechanism intact so great was their wonderment at what could be accomplished with it By the wider application in a commercial way of some of the submarine detecting dovices it may soon be possible to make collision with ships a thing of the past and disasterfrom derelicts recepts and other floating dangers quite unheard of the same devices may be used also in locating sunken vessels so that attempts at raising them may be made and meditecting the mearness and location of reefs the shore and any object of size in the water. Such was inventions will be of permanent and increasing value

#### Hydroelectric Power Plants

It is to be hoped that the war s fuel crisis will lead to a wider use of our hydroclectric power of which 3 per cent has been devel oped and the carly introduction of th great central power plant plan which proposes more efficient use of fuel near its by common arriver lines The strement is made that for every 5 900 000 000 hydrolectre horse-power put to work we save about 17 000 000 time of fuel annually and release for other employment 100 000 of the men who spent their lives following coal around from the bowels of the earth to the ash pile. Italy and France are making progress in using their water power while here since 1993, things have been waiting for a few technicalities to be

The influence upon our scientific teaching can hardly fail to be beneficial providing those responsible for the business management of educational matitutions take account of the accessity for proper salaries. The faculties of nearly all schools have been shaken from their traditional ruts many men have had to resume new responsibility and still others have had business and practical experience of great value Feachers and students able have had many opportunities for research much of it in the great field of organic chemistry in which we Americans had not been as profesent as we shall henceforth become

#### Surveying from the Sky

A host of war problems the solution of which might mean benefits in peace remain incompletely solved, and still newer ones have been uncovered. Thus the airplane will no doubt be widely used from now on in making topographical surveys quicker and more accurately than by older methods— Arphane cameras with lenses of 50-meh forus and elever mechan-cal devices have been provided for such work, and they proved their worth on the western front, where in 1918 more than 250,000 negatives were taken by the British aumen alone. But we shall continuc to have airplane problems for chemistry to solve such as a fuel for use at high altitudes, when oxygen is so scarce that gasoline will not give satisfactory com Something is needed such that it will not only be a valuable fuel for internal combustion engines but in burning will liberate oxygen for the combustion of other ingredients of the mixture

Let us learn our lesson well and remem-ber it. We should not require a war to awaken and stimulate us. Now that we have made a creditable beginning let us continue with full attention to cuoperation education and research. It is the discovery and application of scientific truths that count large in the world's progre

## The Current Supplement

WIRELESS telegraphy was sufficiently wonderful when it was new and wonderful when it was new and imperfectly understood, what then shall we say of wireless telephony, which pro-jects through the ether, not arbitrary signals, but the actual human voice? The developments which have brought this achievement out of the realm of dreams and



# Hot Windless Days

the kind that makes any movement an effort! A hurry order must be filled -- the factory must be kept running the sick list must be kept down.

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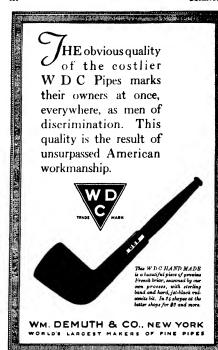
Booklet, "Air, Light and Efficiency,' tells how we helped the owners of some famous factories to get 1410 maximum returns from their investment in Lupton Products. It's free to plant officials, architects and engineers Build Now, and begin ears



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an that exclusive it sidulated toon at 14th and L Street 8 (5 minutes walk from the White House), has opin end its doors to trainvent gui stay. For many years the Dewey has been in the official residence of Senatics and those promisent in official fired the Capital To accommodations are himited, and only those whose presents will be compatible with its clinicities will be useded. It will be best to make reservations by letter to accommodate the control of the control of the Capital 
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New York

into the domain of cold, herd facts have been concentrated in the years of the war. Once assemi and as a consequence the story has never been told in connected form. A summary forth over been told in connected form. A summary of the briefest sort appeared last week in these pages; and beginning with the current same. No 2259, for April 19th, we earry in the SUPLIEBLET the complete story of Ratic Telephony, in three installments, as told by two of the men who have been among those active in the work, Other articles possess almost equal interest.

There is the discussion of Molecular Association and Chemical Combination, in which French authority gives his views as to the relation between the forces of ordinary coheson and of chemical affinity. In somewhat lighter vein is the profusely illustrated account of Familiar Insects through the Camera. Mr. Hurley's exceedingly able discussion of the shipping situachance and Electricity, Professor Franklin of Technology presents an extremely striking array of analogies between mechanical and electrical action. The various answers given by scientists of various branches to the long-standing question, How Old Is the World? are collated and compared Shorter discussions of interest include The Industrial Use and Limitations of Respirators, Gas Masks and Oxygen Breathing Apparatus, and Widening Do-mand for Blust Furnace Slag

#### Floating Mines in the North Atlantic and the Arctic Ocean

by me in my investigation have been at the various points of the Atlantic Orean here mentioned, after the lapse of 10 or even 20 years—It should be rememdered or even 20 years It should be tememorered however, that the mines tend to disappear more rapidly than the floats because of their automatic destruction.

The coasts of the United States are pro-

tected against these instruments of danger, coming from Europe by the polar current which flows from the north toward the coast of Florids. Such are the conclusions to which I have been led by my occanographic studies and which I now wish to apply to the safeguarding of the navigators who may still be menaced long after the signing of the articles of peace by the genus of the "frank and joyous" war.

#### Locating Unexploded Shells on the Battlefields of France

(Continued from page 395)

the location of fragments of shot, previous to operation The first experiment of this sort was made in 1881 upon President Garfield, and the balance at once located

the hultet, which had eluded all probing.

The "Alpha" machine of Professor
Guitton comprises two large wooden rings,
upon each of which are mounted two coils
of wire, the one traversed by a variable
current, the other in circuit with a telephone. The second coils in both passes are The second coils in both cases are in circuit with the same instrument; and e connections are so arranged that the electromotive forces respectively induced in the telephone by the two variable cur-

rents are in opposite senses.
Under these conditions, if the two pairs of coals are identical, and if there is no metallic object in the immediate neighborhood to introduce perturbations, the two electromotive forces compensate exactly and no current is produced in the telephone circuit. The instrument accordingly remains silent. But on the contrary, when the apparatus approaches anything of metal, the induced currents are such, under the modification of the magnetic field thus caused, that the electric symmetry of the system is destroyed and the telephone gives off sound.

off sound.

The apparatus can be taken down for live only plans for a bridge which were packing and transport. It is controlled by means of two small cold inserted in the Moderate of the Mod

is obtained in the tele calibrated, the operator walks back forth over the ground to be tested: assistant follows, carrying in a small | the induction coll which supplies the

n. this way it is possible to discover a metallic mass of as much as 10 kilograms at a distance of 40 or 50 centimeters, or a smaller fragment at 25 or 30 centimaters. But the sound given out by the telephone is to all intents and purposes the same in either case, for its intensity is directly proportional to the mass of metal in question and inversely proportional to the depth at which this mass lise. Incomplete information is thus the best that can be had, and it becomes necessary to remove the overlying earth in every case with the care that would be employed if it were known that a greande was buried at a depth of only a few centimeters. Moreover, operation is rather slow. Professor Guitchen estimates that it would take about three hours to explore thoroughly the smaller fragment at 25 or 30 centimeters. three hours to explore thoroughly the surface of one hectare (2½ acres); others insist that this time is altogether too short for the task. So while capable of rendering good service, the instrument is apparently not the last word in the solution of this extremely complicated problem.

#### The French Problem of Reconstruction\_I

(Continued from page 297)

in his own town almost invariably, if she is to marry a farmer, because to marry one in the next town will be to have two farms too far apart to attend tol

To rebuild a ruined town alongside the ruins would mean that some one would have to give up his land—his cherished

Aye, someone—but who would do it?
Why should Pierre and Monte, and Henri
and Jules give up their land? "Liberty,
Equality, Fraternity"—words that have
blessed France many times are sometimes breaced render many times are sometimes her curse. No, the little towns will be rebuilt where they stood or not rebuilt; and that makes both an engineering and an economic problem, neither of them easy

### The English Channel Tunnel

(Continued from page 399)

government always warmly endorsed the

Hawkshaw's design called for a single double-track tunnel, the boring being 36 feet in diameter and the finished internal diameter 30 feet. Its length was to be 31 miles and its cost \$40,000,000. Much study miles and its cost \$40,000,000. Much study was given to the question of ventilation, which was provided for by building the tunnel with three arched air-passages formed in the solid floor of the tunnel, which was about 10 feet in depth which was about 10 feet in depth. Ventilation was of prime importance because it was proposed to use stam locomotives. Investigation showed that, in those days (1675) the proportion of the control of the c parts, and in the law courts of London, 19 to 20 parts, and in a first-classe carriage on the underground railway 22.5 parts, per 10,000. With 48 trains such 24 hours drawn by steam locomotives, it was estimated that the carbonic soid gas at each quater-length of the tunnel would be 12% parts per 10,000 in excess of the normal quantity of 314 parts

## Proposals to Bridge the Cha

Of the various bridges proposed, note should be made of the Boulet suspension bridge, which was to be carried upon 29 cast-iron piers extendings 480 fact above sea level.

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lever carried upon two piers 1,500 feet apart, and a series of suppended spans 376 feet in length carried by the cambian and the series of the built by the causeon method. To caseon 100 feet 1250 feet plans, were to be towed out and sunk through the overlying mud to firm bottom. He total length of the bridge was to be 24½ miles with 118 piers and two obtinence piers. Provision was main for two railroad tracks and the total wught of steel in the wholebridge would have been 771 205 tons. The estimated cost in 185 was \$170 0.00 and the total cost in 185 was \$170 0.00 and the first the series of the series of the series of the destruction of the cost to the destruction to far her to \$400.000 000. Not merely the cost but the destructionty of a bridge renders that type of crossing out of the cusestion.

#### The Present Plan

The strata at the Channel consust commencing at the bottom of Goult and upper green sand the lower chalk followed by the middle chalk and the upper chalk. Th tunnel will be driven through the grat chalk which is found at a depth of 89 feet at Dover and 80 feet at Sangasto The material is compact and impervious water it contains no finite and as a substantial commenced by the substantial contains an official standard and the substantial contains and so that the substantial contains and so that the substantial contains and so that the substantial contains a substantial

#### Drainage

The drainage system will consist of separate tunnels which will tap the main tunnel at the lowest level, and diverging from the line of the tunnel they will de second on a slope of 1 in 250 to drainage shafe located on earl level to drain they also will be lined with cost-tron. By the use of boring machines it is expected to make a spood of 17 yards per day for sur days of the week. The ventilation will be by way of a conduit at the top of the tunnels. Air will be blown in by high-speed fans in the direction of the traffic. The estimated cost today is about \$100 000 000 which will be shared equally by the British shared could be shared equally by the British.

There is no question but that the tunnel will now be built 1 he former British fear of invasion never well founded, has dasappeared in the prosince of the close alliance of the past five years and the demonstrated value of the tunnel in the event of future joint hostilities of France and Great Britain against the common enemy Probably construction will await the return of more normal conditions in the industrial world, but we look for the completion of this great work within a

#### Automatic Wireless Receiver Which Anyone Can Operate (Continued from page 402)

give successive nucreases in the receiving wave length from 150 meters to about 3 500 meters on the ordinary ships antenna. The meters on the ordinary ships antenna. The meters of the ordinary ships operation may be correspondingly varied of the ordinary ships of the ordinary terms of the mechanism at any desired point to listen to signals. The wave length of the receiver at any given moment is milected by a count of the whole means must a natifiest



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Caven an automatic receiving set, such diese that on the main steamship gipsion at the comes perfectly obvious for sufficient to impede navigation does not that the necessity for standard wave occur more than 12 days in a year 2 And laughts is more or less shattered 1or no there is the directional wireless to fall lengths is more or less shuttered. For no matter on what wave length a transmitter may be calling the receiving operator is may be taking the receiving operator is bound to pill it up in the course of his automati receivers cycle. At the same the this receiver greatly simplifies the wal. I the operator who is no longer of by the manipulate numerous handless and Ind s mecesantly in order to keep in ton h with everything taking place in the other to led at becomes possible for the layer to to citize the same results with the professor il sperator

Visual t of these unicontrol receivers bayed non-use for some time proving in In fet set 1 it of them were employed by the Sign I Corps for detecting enemy wire less to thus. In the case of the portable Sign IC orps apparatus a hand crank only was provided for friving the train of gears

#### Exporting the Bolsheviki

( 11 1 lf 11 page 40°)

I regime in which a great industry is lattit mlto become profesent in the rail force of our hinery and mipleha wight that malestry may be carried on Readjustment in the Northwest

It with the wan was formerly the heart et the whit pine lands but most of the find r bisele nout and the production of hund r has I st its carber importured of that r has tast tas carner importance.

Several t was have well-composed machine all ps slyre frequently limberated have come to hay I gaing in chancey. This product of Wisson as a transfer of has been employed. it coumber of camplete mills in Austral \ ms hus that stamps the Australia A has lime that stamps the name I the lumber manufacture upon-ea h I arl produced by his mill was in-vent I by a men in the Northwest and seems assured for good market in foreign So the passing of the lumber

An rian munufacturers will cast an an hirit windward by gaining new cus-tem rs intende of the United States The extension of our foreign trade is esscattal not only for national prosperity but for rational safety

## Aertal Greyhounds of Tomorrow

(C'minued from page 401)

sumfur mooring tower for several weeks at a time with winds blowing up t 50 and more miles an hour, without

sustaining the slightest damage.

The disjoint service will be no fair with ler proposition so we are assured the elements of weather that bave influence on airship travel are wind rain had snow and fog. It is not licely that much certainment travel are wind rain had some and fog. It is not been the fact bull snow and fog will of themselves have much influence on analop flang. With auntable run proof non-absorbent after covering the absorption of water 11 I the consequent increase of weight are 15 ide.) Hail and show will not adhere t the huge hull when in flight owing to the high speed through the air and in any case as the precipitation that is not usually more than 8 000 feet, where can be entirely avoided by flying above this height 10 cm might give trouble in landing, but in flight the airship would be above. the fog and not be affected by it. In han hing suitable means would be taken to

back on as already suggested

The only important factor that need be taken into consideration is wind, but in most cases unduly strong winds can be avoided by flying at a higher level or staling avoint of by hying at a rigitor two or saming on a different tourse so as to avoid the storm are As is well known, there are it see level between certain clearly-defined latitudes provailing winds of con-stant direction of which advantage may be taken by, smitably laying out the course and route to be followed. Again at the higher levels, there is at most latitudes a constant drift of which advantage may be taken if the winds at sea level are unfavorable At any rate the matter of wind is not a serious one when the navigator has so broad a medium in which to sail

#### Sky Pilots for the Sky Lin

The mivigation of surships is similar in principle to that of steamships but is made more difficult by much greater drift to be allowed for the actual course of a be allowed for the actual course of a ship being the resultant of its own forward apord and that of the motion of the air in which it is 1 orie it is impossible for the manginer to plot his true course relative to the irrh unless he is aware of the in turn of the air. When navigating over hand be sable to the termine the drift. of his ship by observation of a suitable fixed point on the earth's surface, and adjust his compass course accordingly to give the desired true course. Over sea, of course no fixed point is available, so if the motion of the wind is not known, the course unust be periodically corrected by astronomical observation and discrimination of his charted position

A reliable and effective included of navi-gitim is however, available with the wire-less installation. If the ship is in communi-cation with two stations they can deter mine the direction of the transmitted waves and signal back the ship s bearings undustice have believed to replace it.

If pure if the Boshevite is the man without plot Be strang to the start and the new departure determined. It is known that this include strength is the start in the first and the new departure determined. It is known that this include strength is the start of direction was used successfully by series if talk if it has any bearing too and butter ground of the total way. The strength is the four years of war but more like it is the start of the

of the voluminous documents and drawings of the British engineers, it is obvious that acrual transport is close at hand lech muslly seronautical men are prepared to open airship routes to-morrow financially, there is some question. The engineer has gone ahead and done silt the planning, the constructors stand ready to execute the plans stready in hand but the capital for such a project is still to come And it will come for the airship must soon develop into a rapid means of travel between distant cities and countries and continents

#### New Industrial Uses for X-Rays

I N an address delivered before the Bir-mingham and Midland Scientific Society, British, on February 19th, Major Hall-I dwards stated that radiography was capable of much wider application to industry than was generally supposed to be the case He mentioned that X-rays had already bech used in connection with showed some radiographs of sero engines which plainly revealed defects in the internal structure of the castings. Car reigns had also been subjected to exami-nation by means of X-rays, with the result that inequalities in the disposition of the metal sufficient seriously to affect lan lun, suitalvie means would be taken to jod the metal sufficient seriously to affect mark the landing place by means of raptive the trajectories of the projections, had been balloons or kites, and strong searchighted discovered. Wood for surplance had been could be used on the ground Rain, hail sure want for are also generally local in gasted that the investigation by means their occurrence, and could in any case of radiography of conditions of strains, generally be avoided by a short deviation compression and bending would yield a reform toute Cross-Atlantic records in jointstion of much importance.

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(14307) M. C. asks. Why does the month

political from time to this, and will be mainted on the february, contains and days. Why does the month of February, contains and days and sheat they own the february every finer versus in order to show the february every finer versus in order to show the february every finer versus in order to show the february every finer versus in order to show the february every finer versus in order to show the february every finer versus in order to show the february every finer versus in order to show the february every finer versus in order to show the february every finer versus in order to show the february every finer versus in order to show the very indured to chase unlock the great property by holding up orders in hope of a drop in prices. If we all did that, business would be at a standstill.

Poffessor Irving Fisher of Yale says "We are on a permanently high price level."

Patroote, far-sighted business men are grouped the calcular and the versus of the control of the control of the show the property fine t your city. Ask life I branian who will be glad to get you the books from the shelves

(14308) N A > asks Please tell me if restain volume of any anotations will weigh mer at 10 000 20 000 10 000 40 000 feet in the ar thair it does at was keet. In there any difference whether those weights were taken on heights of land or straight up into the air from the sea. A The weight of all bodies due to gravity decreases as we rise above or go below the surface of the earth. Nor does it matter whether the weight is earth Nor does it matter whether the weight is taken on a munitaln side or in a balloon or air isken on a pountain silt or in a balloon of air plane. It is the attacktion of the earth as a whole which gives weight to a body on it. The air on the other land hows up and bodies as much at the air weight which the loody displaces. The buyener's at control of the loody displaces. The we are above, half the air he buyener's which the increased by the same amount. If then we had a solid a light that the decrease of the weight by gravity in going up from the certiful sourface was been than the safet few model with more of a count feetble slittled. We do not know any such solid.

(11309) C W W asks Would solenoids (11,00) (\* W is asies W this ordernoids arranged to profits a reciprocation notion of a core controlled by an automatic reversible awtich for a core controlled by an automatic reversible awtich the large water factor of the core of the large water factor of the large water factor of the large water factor of the factor of the water factor of the water factor of the water factor of the large water factor o

(14310) I M H asks Willyou please in form me if possible as to what can be added to a mixture of act tone and act the ether which prevents rapid exaporation when the mixture is used as a rapid exaporation when the mixture is used as a solvent of the celluloids. A We do not know any way to prevent evaporation of a volatifi-liquid except to abus it tight in a far or bottl. The free given will then become saturated with the vapor of the liquid and after that state is reached those will be no further evaporation.

rached there will be so further evaporation (14311) B H saks: I so white a color? If so pickas explain why it is not a color 2 the some thermometers there is a glass tube filled with this liquid and crystals which is supposed to indicate weather. This tube is assisted up and I do not see how the atmosphoric pressure and hundridge can affect the contents of the tube How does it.

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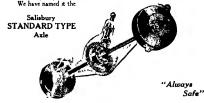
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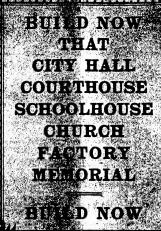
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The object of thus y wind as to record a writely and twelfly the latest scientife within at and individual news of the day. As a weekly y tool it us in a position to announce interesting level y ments before they are published leave here.

The Editor is glid to have submitted to him timely artilis suitible for this is luming respecially when such articles are accompanied by this ty tiphs

#### Jellicoe on the Grand Fleet

STIDOM if ever has the commander method of maxil or multirey forter given to the public so candid and illuminating a store of his war ever considerable and the following every construction of the start of the star

The work has been spoken of as an apologia written for the express purpose of defending the author against criticisins of his strategy and particularly of his tactics in the famous battle of Jutland but we are free to confess that a careful reading of the book has left no such impression upon our mind. Rather we carry away the impression of a straightforward story told with characteristic sailorman frankiess of the day by-day experience of the fleet is viewed from the position of its commander in thicf Had the Admiral been writing a private deary of the war he could scarcely have been more flank in his statements of defects in strategy that had evidently been imposed upon him from without or in his revelation of the unpreparedness both of the Grand Fleet and of its naval bases in the North sea for the stupendous task with which it was so suddenly confronted

And reading between the lines those of as who follow the course of naval affairs in the United States are able to place the blame for unpreparedness where it belongs it was not the fault of the Jellicese the Percy Nectis and the Beattwe of the British navy that the Grand Fleet, short of destroyers short of submannes short of secutcrusers, short of up-to-date range finders and searchlights, was ordered to Sups I how an utterly unprotected base upon to distroyer and submanne attack—no more afther fault than it was the fault of our own Dewevs and Simees and backes that our batth-ship fleet was less than one half of its proper not mechanism for the containment of the proper and the short of the containment of the proper and the short of the containment of the proper and the short of the containment of the proper and the short of the containment of the proper and the short of secuts and destroyers and had no bettle crusiers whosever

So long as navel appropriations are mode the sport of the politerians a great navel power list the United States or terrat Britain will be continually faced with the possibility of diseasest. And see long see a political list Chirchild can force in Craud I better do its cooling in air epen and undefended harbor opening onto submanimentated water or bring strong pressure upon that flert (an Churchill actually did) to engage in such a mad venture as a bombordinent of the Hispoidand forts the norsh even of the high command will be disturbed and their sortness of themselves and their strates of the more strong.

It is unaring to harm how alight was the superiority in capital shape and how deried the inferrent's in distroyers and light remees of the British to the Germans in the North's Ne during the early months of the war. Being the blockaded fleet the Germans could cleet to come out when every whip of the High-Weak Fleet was in perfect shaps. The British due to continual cruming in one of the stormiest of sons always had

some shaps undergoing refit or require Thus, Admiral Idlicoc tells us that towards it closs of October the Grand I ket was considerably weak and spart from the fact that it had lost the Addacions The Ajax had diviloped condensar defects Iron Duke similar troubles the Origin' had to be sent to Greenock for examination of the turbine supports which appeared be noted are dreadmonght battlesings) was at Devon port refitting and the "New Zealand was in dock at Cromatty the 1rm and Agmourt having been movely commissioned, could not yet be regarded as efficient so that the drundmought fleet consisted only of 17 effective battleships and feed the cruisers. The Cerman drendmought fleet at the tone comprised 15 battleships and four battle-ormsers with the Blucher in I veryone will agree with the Admiral when he savs The markin of superiority was therefore unpleas antly small in view of the fact that the High Seas Ficet possessed 88 destroyers and the Grand Hect only 42

Admiral lethics says that he often wondered why the curmons did not make greater efforts to richer the British strength in capital shape by destroyer or sub-matrix attacks on the British has a during those early those early like possessed. In many in comparison with the uses to which they were required almost super-fluid to destroyers certainly a super-fluid vaccing and the could not have put them to in better use than main attack on 8 ups 1 low during the early months of the 1014-1015 whiter.

Speaking of the frequently-made suggestion that the formal Fleet should make an attack upon the ligh Scas Fleet at anchorm it home port he saws. They not only possosed the most powerful and imple artifler defences that we know also that the Germans had a very efficient uning service, and we were justified in assuming that they had protected their naval bases by extensive name helds. We on the other hand were cutricly unprovided with this party olds form of defence.

laken altogether it is evident that the Germans mosed their great opportunity at this very time. How they failed to know of conditions at Seapa Flow is puraling to eas the least. The Zeipa line should have provided this knowledge. The Admirals seen suggestion is that it may have seemed impossible to the German and that we should place our flost. upon which the Empire depended for its very custome in a position where it was open to authorize or a position. Because between the lines it is very violent that Admiral Selfices and his staff were not responsible for the selection of Stapa How as the naval base in those perilous days.

#### The Revival of Amateur Wireless

HESE are glorously bus days for a certain class of Young America familiarly known as the wire-less amateur. In the attice or basenent, city bedroom or backyard shed, he may be found in his spare moments hard at work getting his station in order. The accumulated dust is being wiped off tuning coils, telephotic receiver and variable condensers and the various components are being feverably assembled and wired to receive the writens signals. And in many instances three is a sinse of restless expectancy not unlike that which comes upon one watting for the curtain to rate for the decision at a play for this fact is that much has but done in wireless withgraphy and telephony during the past two years and their are many new and strange signals ready to greet the amateur.

It was the recent riskstment of Acting Secretary Rossewth of the Navy, to the effect that all restrictions on receiving windess stations were raised as from April 15th last that revived amottive wireless. Five since the war the aimst urs had been previoted from transmitting and receiving and while many are disappointed that and revering and while many are disappointed that the thing of the receiving restrictions have been removed, all dark the Navy has at least made a start the thing of the second of

Amateur wireless is to be more firmly established than ever before. Having been successful in warding off proposed laws unended to stife amateur wireless from time to time in the past, the young and old Americans engaged in this most remarkable of all hobbies are in a better postion than ever to mantain themselves Surely.

it would be an ungrateful government that would again challenge them after their remarkable record in our war afforts.

Aside from having supplied some ten thousand radio operators, who stepped into the Army and Navy practically ready to be put to work, the wireless am of this country supplied our Government with leading radio engineers Major Edwin Howard Armstrong for mstance, has been a New York amateur, and Press dent of the Radio Club of America. During the war, he has been in charge of the Radio Research Section of the U S Signal ( orps in France He is the inventor of the well-known regenerative vacuum tube circuits, which greatly helped to solve Navy radio communication problems. He helped to perfect the radio receiving sets for airplane use, thus permitting instructions to be received instantly ins ead of by means of cloth strips on the ground as formerly. He designed a very efficient multi-stage amplifier for use in simplifying the weak currents in small receiving loops, and so on He has been an assistant to Prof M l Pupin of Columbia University and the winner of the gold medal of the Institute of Radio Engineers for the best radio invention

Then there is I Johnson, Jr Director of the Radio Chib of America in peace times and I vpert Radio Aide U.S. Navv. in charge of technical division of the Naval Aircraft Section, during war He was the organiser of the foregoing-mentioned division which, within a few months, had in operation radio telephone sets on board most Naval scaplance which greatly helped to patrol our coast during the U-boot scare Lieut H salenwater U S N radio officer in charge of the radio technical work on Navy NC planes that will start across the Atlantic, also a Director of the Radio Club, Ensign Frank King, U & Navy, radio officer in charge of Radio Laboratory for Aircraft Radio at Norfolk, Va, and later radio officer in charge of Navy aircraft radio work in I rance who is a past president of the Radio Club of America Ensign George Fitz U S Navy, radio officer in charge of Radio Laboratory for Aircraft Radio at Norfolk, and later in charge of radio work in Englandthese and many more, are old-time wireless amateurs whose hours upon hours of experimentation and tinkering were capitalised to the end of helping the United States

So that can be no doubt that the wrieless anataur has proved his right to existence. He reduters into his hobby with a broader knowledge of wireless in particular and electricity in general. Wireless communication is more mysteraust than even and pruniness for more in the future than was ever believed possible. Long live the wireless amateur!

#### Popularizing American Aviation

AVIATION is a thing which requires constant advertising if it is to survive. Before the world war, England, France and Germany kept up public interest in airplanes by aviation meets, huge prices, and spectacular feats. In marked contrast, little was done in America, and as a natural result the public cared little about airplanes. When we outered the war our aeronautical equipment was conspicuous by its smallness and general backwardness.

In order that we may not lose our splended position in the seronsutical world, which we have gained through almost two years of intensive war efforts, it is to be hoped that airplanes and airships will be kept before our people In this connection the coming Second Pan-American Aeronautic Convention and Exhibition is a hopeful sign of our future aeronautical policy This gigantic under taking will be held from May 1st to June 1st, 1919, inclusive, at Atlantic City, N J, under the auspices of The Aero Club of America, The Aerial League of Amerand the Pan-American Acronautical Federation Exhibitions of the latest types of lighter- and heavierthan-air machines, the reading of technical papers by the leading men in the seronautical industry, motion pictures and lantern slides, races and contests of all orts for all classes of machines, parachute contests, intercollegiate contests, avisite (bieyeles and motor eveles with wings) contests -all these things are feature of the remarkable program for the month of May, 1919, at Atlantic City, N J The governments and seronautic. sporting, scientific, industrial and civic organisations of the United States and all the countries of the world excepting Germany and her allies, are invited to sent representatives to attend this great aeronautic event.

## SCIENTÍFIC AMERICAN

#### Naval and Military

Training for American Merchant Marine.—The United States Shipping Board recently announced that since the establishment of its squadron of merchant marne truning skips in January 1918 up to the first of April of this year, 22,523 American an utissue were accepted for training to the ships as apprenticed salars, foremend stewards. The course of training is two months and the Board announces that it now wants 2000 mar young men for the training as apprentices

Zeppelins as Naval Scouts —The German idenometrated during the war the supreme value of Zeppelins for naval souting Adminal Sims in urging the construction of these arehips refers to the trip of a Cerman Ampholin Blaigaria with supplies for the German force in Last Africa. When she had proceeded beyond Khartoum, she was recalled by radio because of the surrender of the Cerman forces. But covered 4:300 mills without a step and was solf for 108 hourself.

To Organize a Trench Mortar Regiment — Ibwattime organization of trench mortar batterns with the divisions is to be abandoned in favor of a single trench mortar regiment, which will be organized as a part of the arroy artiller; to be useque do for duty by the sermy commander Trench guns resulted from stabilized trench warfare and the divisional batteries but their usefulness excepting under special conditions when the Allied attack turned the warfar into an open struggle For that reason, the trench mortar units of all divisions were among the first to be sent home

Port Facilities in the United States — the United Rates Shipping Board has drawn up a last of ports and harbors of the United States which are capable at meas low water or mean high water of a commoditing vessels of 5,800 gross tons, with a maximum draft of 24 feet. They are lasted in three classes with 2 in Class A, 10 in Class B, 20 in Class C, and 5 in Class D, the prote capable of accommoditing ships drawing a feet. Nature has been bountful in providing our 1,1000 miles of coastline with deep landlicked bays and broad estimates which offer sele harbor to ships of all broad statements.

Artillery in the Late War.—In his final dispatch, Field Marshal Sir Douglas Hug gives some straining figures showing the growth of inclinative In 1914 the British had one machine guit to 500 infinitymen in 1918 they had one machine guit to 30 infinitymen, and their artillery rose from 486 guins at the outbreak of the war to 5,437 at the signing of the armstitle On the British of the Somme battle in 1918, 13 000 tons of armiunition were fired by the British, in 1917 on September 20th and 21st, 42,000 tons were expended and in the three days when the British broke down the Hinda dung ine September 27th to 28th 1918 nearly 05,000 tons of shells were fired by their artillery.

Men. Versus. Ships.—An outstanding lesson of believes a story of the Grand bleet is that it is men not material, that win battles. The supposed great superscript of the British fleet over the Germans in the North-Sea simply did not exist, at least in the earlier stages of the war, when the German High Seas Fleet Consisted of 15 battleships and four battle-crussers, and the British Grand Fleet of 17 battleships and five battle-crussers. The British access in battleships was offset by the fact. That Germany had between 90 and 90 deservoirs to Great British at 15 these fagures apply only to the North-Sea, where the total German strongth was concentrated and where a part only of the British fleet was present.

Last Year's Shipbuilding Output.—Outside of Germany and Austra-Bungary, the shippards of the whole world during 1918 produced 5,477,444 gross tons of merchant shippung, as given in the Annual Summany of Lloyd's Repeter of Shipping. Into its 70 per cent higher than the total in the year 1913 which held the record for construction and included the output of Germany, Austria, etc. The total for the United Kingdown in 1918 was 1,348,120 gross tons and the output for the United Risates was 3,03,030 gross tons, which is equal to that for the ten years 1907 to 1916 in the United States, and half of this was built on the Pudific Coast. Of the United States total custout of 5,025,260 tons, about 1,000,000 consisted of wooden

#### Science

An Ornithological-%obbery — Dr. W. J. Holland director of the 4 arangil-Wilmann amounces that a shipment of birds collected for the museum by S. M. blages ment of birds collected for the museum by S. M. blages of a large part of 189 contents on its arrival in New York utt oand robbed of a large part of 189 contents on its arrival in New 197 keys are not of the collection of the series of the collection of the series of

A Service of Eugenic Advice — The Digenies Record Office at Cold Spring Harbin Long Island reports that it carries on a rapidly not asing amount of correspond once in response to requests for advice concerning the congenial times of proposed incarranges. Most enquiries grow out of two situations viz. (1) cantic nighteel cours manings and C20 the marriage of persons in one or both of whose families there is a nitropathic taint. Persons making requests for advice along their lines are always required to prepare family-history data according to instructions given by the Office. I ingenies advice is then given in accordance with existing knowledge of the inheritance of traits.

New Sources of Rubber in the United States -On behalf of the Carnege Institution of Washington an extensive survey of the Great Basin region for rubberproducing plants was begun in the year 1917 as a waremergency project During 1915 this broadened into rehensive search throughout the western United States for species known or suspected to contain rubber and the work will be continued until the rubber-producing possibilities of the native plants at least have been fully investigated A chemical laboratory has been installed for the grinding and extraction of the plant material In addition to species of Chrysothamnus and Ericameria, the first genera studied 18 genera and 30 species have been examined chemically and in four of these the perentage of rubber was high enough to warrant the hope that the species may serve us a commercial source of

Weather Bureau Begins Work in Volcanology -Under authorisation of the current appropriation act for the Department of Agriculture which provides \$10 000 for investigations in volcanology the U S Weather Bureau on February 15th 1919 formally took charge of the volcanological observatory on Lilaues Hawanan Islands Prof 1 \ Jaggar Jr formerly of the Massachusetts Institute of Technology who has been director of the observatory since its foundation will remain in charge. The investigations at Kilanea were begun in 1912 under the auspices of the Massachusetts Institute of Lochnology, and since 1913 have been many tained at the expense of the Hawanau Volcano Research Association consisting chiefly of residents of Honolulu It is expected that the Weather Bure on a work in volcanology will be developed in many details and eventually he extended to Alaska and other regions under the control of the United States in which active vol-

The International Catalog of Scientific Literature - This important scientific bibliography is normally published in 17 volumes per annum each volume bring devoted to a separate branch of sounce. The last annual report of the United States bureau of this undertaking situated at the Smithsonian Institution, calls attents in to some of the difficulties that have arisen in consequence of the war. Six of the regional bureaus, viz. ( Austria, Hungary Poland Belgium and Russia are in arrears with their contributions to the extent c warh \$9 000 per annum, and it will be necessary bt un a subsidy from some sour e to finance the annual issue of the catalog as was done in cornection with the fourteenth issue for which grants were cotained from the Royal Society of I orden and the Carnegie Loundation of New York It is especially interesting to learn that the work of and ving the literature published in the countries whose regional bureaus have closed has been carried on largely by the central bureau, in London where already 15 000 reference cards have been prepared for the German literature of 1915 The central bureau could continue to index (serman literature, in case Germany is excluded from cooperation in the enterprise in years to come It has been proposed to broaden the scope of the catalog by including the literature of various technical industries, instead of limiting the work to nurs whienes

#### Electricity

Improved Lightning Discharges -According t the Reine Generale de l'Electri de la French patent has been taken out for a new form of lightning discharger of the vacuum type. The new principle consists it using a radioactive soft (radium chloride is suggested to furnish the necessary iers in the tube to produce an instantaneous discharge across the gap in this way it is claimed the time lag between the application of the excess voltage and the dis hoge is muterially bissened Resumption of Amateur Wireless - All restroits ms upon the use of radic receiving stations other than these used for commerced truffic were removed on April 15th last. The order which was innounced by Acting Secretary Rosevett of the Navy Department applies to amateur tecinical experimental and other stations The restrictions on fransmitters however remain in effect for the time being

Radium Indicators for Switches and Pull Chagins ——Among the intest novelities in the electrical equipment in the control of the product of the control of th

Peat Excavating by Flectricity—The efficient digging out of past practically increasities some form of excavating machinery and it is interesting to observe that according to the London heterizating, and heterizating clearly driven appliance of this kind has been in use in Holland driven appliance of this kind has been in use in Holland also buckets, into which the past when cut out is deposited. The machine is driven is an electric motor. It is possible to cut 1100 club ayards of peat per day of 10 hours, which is equivalent to about 350 tons of dry post. The machine can be proposed to the machine can be provided forward on rails laid on the surface of the part or when the water-level is near the surface on the dick of a raft.

Electric Precipitation of Particles from Waste Gas - in interesting development in the electric method of depositing solid materials in suspension from waste gases is recarded in the Flectrical World. In a copper refining plant in the east, the Cottrell process of electric precipitation has been applied to remove 90 per cent of solid and liquid particles in suspension in fluc gases and it is estimated that within quite a short negod the amount of copper and gine reclaimed will pay for the equipment | Lie discharge takes place at 100,000 volts and 0.5 ampere and the transformers used have tappings at 50 62 7 and 87 per cent of full voltage Another example of a similar process is given in American Gas France and which summarises the work of Dr. 1. D. Davidson on the treatment of coke-oven gas. In this case deep utt les are precipitated by an electrical method an map right testure being the removal of tar, which has always been a source of trouble

Wireless Equipment of the 'George Washington - The stenmer which has been carrying President Wilson lack and forth between the United States and I more is no doubt the best compared ship aftent as regards radio equipment. Indied it has been referred to as a floating belorid by for wireless experimentation and research. The radio countment on the hist trio with the Presilent consisted of one lew power spark transmitter on 16 300 inster long wave receiving set one short wave 600 meter receiving set for spark signals one short range ridio telephone triasmitting and receiving set one vacuum tube 450 meter transmitting and receiving set. The escorting battleship. Penn sylvania re cived messages transmitted from the high powered stations at Anonpolis New Brunswick and Inckerton in the United States and Lyons Trance intended for the President and relayed them by the vacuum tube, and radio telephone sets simultaneously Messages from the President destined to the United States or France were sent from the George Washing ton to the Pennsylvania by the vacuum tube or radio telephone set and relayed by the battleship s 30-kilowatt are transmitter

# An Airman's Story

### As Told to C. H. Claudy, Special Correspondent of the Scientific American in France

HI was an American although he wore a British and an annex oudern. He walked with a cut hi tool chup and his face we spectrase might be expected for that had smooth into wicking and lack at death through a 10 000-foot drop and then wat hed the

or in through a 10000-root drop and two wat not use choing a couldary hospit deres x r la cut is colour a couldary hospit deres x r la cut is compared to the day of a transport of the day 
I lot I around an I ranged to see anough, or rather at a see counds to know I doubt have any tail left. Yes somewhat everting I act the sear I for 1 to 2 forth long drap. Oh no you lon kget a mig laster and faster a nose draw jet see that the sample fest many have for an other long see that it is ample fest mought. I do in see much hope for no or but it is ample fest mought. I do in the see much hope for more fine in the see that 
hash t mut a was Well we kept right on sperning and the landwape came right on up to next us and I was draw what with the roads and the river and the bottless with might be houses or extension or most anything spuning around an that the straight of the s

I was going to do saything it was do it right than of 1 do so not fink an I pushing disness; because that of 1 do and it is an I pushing disness; but I can t even miles for the life of m which wing I tipped I reminisher for the life of m which wing I tipped I must had on a wing must and on a wing out the life of m wing the life of m wing the life of the life of m wing the wing the life of the life of must be a supported by the life of 
I was all spirits and bandages ankle busted kneo broken two fingers and three ribs busted face out open and with two prize spots in my body that were not black and blue. But outside of being all stove in that way and fet hing like one large sole, if we sail right. Buddin was all right too. He's soleling heightful and apit to stay thrive for hi had two brodshiftings and both arms smashed and wee, burnt musds too, goth in a going to come out.

some day so I m to go home Na, I won t fly any more, so they say In fact there san t going to be any more war flying so they say Never misst that I was in luck to have seen so much

have seen so much What did we do? We Americans? Well, you ought to know what the Americans did in the air line better than I do I was flying in a British uniform before America joind.

get out and

I wanted to

Then middle

Eddie Rickenbacker, the famous American Ace

get in under the Stars and Stripes but those things only happen in books. Lingland had invested a lot of money in training inc. and I guees she had a right to all I had to give Anyan I was it.

give Mayway, I gave it.

Of course all of as requilar ( > A chaps fult zors as a boil that the ( > 5 didn't get more planes and men into be fulter for the game. I he men were splended regular fellows all of them. All the British flying people think the American arman is a danly. They swear by Ritck, you know We I mean they—think the Liberty motor is all right, shrhough they have a big fallow of their on which is some punkins of a motor. But they haven the much to say about the American plane. I flow thow just how much

of this is some one's fault and how much something that couldn't be helped I we talked with a lot of us Amercans in Uncle Sam's khaki about the trouble with the American plane

American plance worked the D H to just into quantity production Well, it didn a seem to hold up if it smaked it just fairly splintered. There are two answers then see a consistent of the wood, spruce which has been seasoning of the wood, spruce which has been seasoned in a hurry ham't the strength of spruce which is naturally seasoned. The other nawer is that machine production of wooden parts leaves out the human element Imprection doesn teem to reach the

"A workman who fits all his wooden parts by hand, and more especially if he is a seasoned, skilled workman, gets an uneanny ability to tell good wood from bad. The

hidden flaw he detects somehow The mapestor cast, to master how good he as So there were a lot of chaps who were out of luck m Americas D H planes who ought to be flying now—as least, that's the way it seems to the Americas flyers in American uniforms Personally, I am morally sure that if it had been a quantity production plane I dropped ten thousand feet in, just landing on the wing pur wouldn't have saved me I'd be ar feet under with the boys

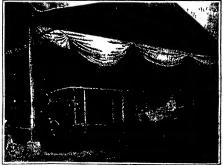
mainting up a headboard for ma Sure I know this sort of thing doesn't get published Heaven knows I'm not knocking any one I like the British lade fine and I've been a member of the family in fact, just aswell as in uniform. They don't say much, but they seen let you know whether you belong or I'm Yankee all through, and don't you forget it, and I'm not getting out any hammers for Uncle Sam But facts are facts and you can't cover 'orn with brush and paint and get away with it. And so when I see a lot of whitewashing done about American participation in not at, but for in country.

the air work over here, it sort of makes me mad, not at, but for my country.

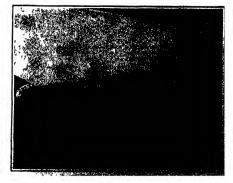
Oh, its natural enough for any one connected with the service to want to make the very best showing he can But—well, I took the trouble to collect a little information as to just what we, U B A that means, had actually done at the front, as to machines and mean

suggested I got my facts from the flying men, no office statutus about tha, and you can call them gospel ryth or German propaganda lies, whichever you choose ben't forget it a Yank in this uniform taking, will you? All right Here's what the U S had at the front.

I suppose you know there were 20 pilots in a squadron! Well, at the armistice the Americans had 12 pursus squadrons. They had one observation group of three squadrons. There was one day-homblag squadron and there we stopped 10 feourse we had night bombers, but they are included in that first twocommunities may be 10 feour may be 10 feour may be 10 feour (Constituted on page 40)



A Liberty sirplane ready for the field, Remorantin, France



## Small Airplanes and the Trans-Atlantic Flight

### Describing the Sopwith, Short, and Martynside Airplanes Entered in the Great Contest

THE coming trans-Atlantic flight has taken a queer turn. Only yesterday everyone in and out of turn Only yesterday (veryone in and out of aeronautical affairs was expectantly waiting to see a line up of giant planes such as the Handley-Page Capron: Farman Goliath and our large Naval machines Surely no one would attempt the flight with a single engine for has it not long been patent in aeronautical contests that even the best engine is upt to fail at the critical moment? Yet at the moment of writing we are on the eye of one or more attempts with comparatively small two-scater biplanes equipped with

a single engine Truly it

is a great surprise

There has been no dearth
of surmen willing to attempt the great trans-Atlantic of contestants already far exceeds expectations and because of the growing er-tainty that the flight will be achieved in short order the contest is fast developing into a race with the largely in favor of the first one to start. Thus it has come about that while most airmen and constructors have been leasurely going about multi-engined planes with every safeguard against a total failure intrepid British aviatore have stolen a march on practically everyone by getting small, i wo-scater ma

ready to depart at dimost any moment. It may be that these aviators are taking a gambler schance with the possibilities of engine faulure and forced landing it may be that one two or the three of thom will fail in their It may be that attempt, but after giving the entire matter considerable thought it would seem that they stand an excellent chance

thought it would seem that they stand an exercised coarse of auce dup hefore this rest he is the rester.

The three small planes referred to are the Sopwith to be flown by Harry G. Huwker and Lieut-Com. Curev. the Martyando which will be the mount of Predunds Philip Raynham, and the Stlori manual by Majos Wood and Captain Wyllis Thou first two are starting from Newfoundland, while the laster is starting from Ire

The Sonwith msc hine weighs, fully loaded, about 6,100 pounds, and carries 300 gallons of gasoline it is equipped with a Rolls-Roye "Eagle" engine, de-veloping 400 horse-power veloping 400 horse-power. In a recent test before the machine left England, it covered a distance of 900 miles in nine hours and five minutes, 146 gallons of fuel being consumed. This constitutes more than a third statement of the constitutes more than a third statement. stitutes more than a third of the capacity of th or the capacity of the sansa It will be noted from the accompanying illustration that the Sowith biplane is very similar to the American Carties training plane in general design. However, it a far more powerful ma-ine, and considerably awar The fairing of the

The faring of the command the command of the comman

virtually amounts to burning his bridges behind him virtually amounts to burning his bridge belind time. It close competing of the Sopwith namely the Martyneide is very signific in appearance to the Sopwith in fact it is more or less blut the famous Martyneide I-4 a machine of a type which was never used on active service although a year before the end of the war it was by some index per hour the fastest as well as being the highest-climbing anylase in the world. Fully the trans-Atlanti ti-foot span Martynside weighs about 5 000 pounds and carries 360 gallens of

gas dine. The cruising caperty with it 20-mile wind



The trans-Atlantic Sonwith biplane with special fuscinge fairing forming a boat

against it all the way is asily over 2000 miles the airmen do not expect to encounter adverse winds for any great atrotch and indeed they are counting on favorshie winds to mere see then speed. In calm air the Martynside makes about 125 miles an hour as compared with about 108 for the bopwith after dropping

its landing gear It as equipped with a Rolls-Royce Fatoon engine of 280 horse power. This mailting does not carry a lifeboat, but the airmen are to be kept warm by electrically-heated asbestos foot warmers and A wireless receiving set is being carried for beneath the fusely. He tank and implies and will have sufficient leaving vit keep the afford if a forced dosent is in do not his surface. Hi tink in Employed quickly

#### The Growth of Ellis Island

A interesting pix 1 pin ering wirk is Long done at I like Island 1 pix 0 ringh with bins inignants enter New York 10 island 11 like insists of three parts only one f which insisting to ignore the like island and that this has concerned, we have the like is with of the island is shown in air title pagall istration

an the upper lift bands antr may be seen the precof the tension in 1890. Later two other islands were built to the southwest of the first one On Island No 2 are the hospital buildings and on Island No 3 are the wards for putients suffering centor patients sunting centragious disease. The original slind known as Oyster Island was barely four acres in extent 1t now covers 10 acres and will soon be extended to over 15 acres the hasm between Islands No 2 in I No 3 will be filled in and the whole area of Fills Island will then cover more than 28 acres or seven more than 28 ares or seven times the area of the original island. The extension is shown in the upper right-hand counce of the title page.

a boat
illustration
Between the main island and Island No 2 there is a ferry basin enclosed by a seawill which originally was built on crib work. Every year this waterway has to be dredged out to get rid of accumulations of sediment, and this constant dredging has had the effect of motors mining the crib work so that the walks bordering the seawalls recently began to sug and break away with the probability that before long the whole wall would topple over into the water. To remedy this condition, it was decided to build new scawalls of concrete reaching down to such a depth that they could not possibly be under-

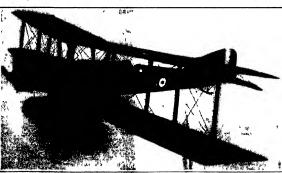
mused by dredging. The work on these walls us now proceeding

The new walls are built of luge concrete blocks just outside the crib work walls outside the crip work wais.

First a trench is dredged in
which are lad bags of concrete. These on hardening
form a good foundation for
the wall. In order to furnish
the concrete blocks with a level bed to rest on railroad rails are placed at either side of the bag work foundstion and the space between them is filled with concrete deposited by means of bottom dumping backets Before placing the concrete, divers caulk up any openings between the rails and the between the rails and bag work by means of long narrow bags filled with conrete. The concrete fill as divers who lay a rait across the marginal rule and slide it along the foundation. In the way the concrete releveled off

very meely. Whenever the surface for a bucket of concrete to till the cavity

After the floor has set the concrete blocks are laid These are huge masses of concrete, 17 feet high and 12 feet wide measuring nine feet thick at the bottom and five feet two inches at the top. They weigh about 87 tons apiece. The process of lowering them into position and adjusting them properly on the from into position and adjusting them property on the foundation is no simple one. In order to handle the blocks, chain grooves are formed in them and when the chains are removed slots 12 inches in disjuster are (Continued n page 44t)



The trans-Atlantic Short biplane, with special tank below fuseinge

receiving radio position reports from nearby ships Meanwhile the Short huplant on the soil of Ireland, is waiting to start It as of the type known as the land bomber "It has been fitted with larger gasoline tanks bomber "It has been fitted with larger gasoline tanks and a wireless appassing after the removal of the former war equipment. In fact the work of preparing it was ranked to the estimate in order that it raight be among tha first to etach. Like the Sopwith, it is equipped with a Reilla-Reyrie angine of 90 horse-power 1t has a span of 31 feet 5 inoless, and weight about 5,000 pounds fally loaded. The pelly tuneual feature of the mending is a isage unspect-bacaged gasoline tank which is fitted

# Emergency Employment Committee for Soldiers and Sailors

Stopping the Breach Caused by the Curtailment of Funds of the United States Employment Service

By D M Reynolds, U S. Comicil of National Defense

Till United States Council of National Defense through an 1 m rancy Impleyment Committee r the parblem from long employment firs thee and of re-word that became necessary to use of the lock

This need became apparent when in Mari 13th the Department of Lahor issue it the fall wong set a ment. Owing to the fullow of the following to fine the Definition of the many distillent funds from the many fine of the post of the Urgent Definition by the Lahor in the Maria Charles of the Maria Charles of the Lahor in the Maria Charles of the Lahor in the Maria Charles of the Lahor in the Maria Charles of sources the U.S. Employment Service machine for placing sold is suitors at I war workers on suitable employment will be relied to 20 per ent fits present size on Marcl 2-d

This simple ann nincem at meant that the I Implyment Service who haduring the first ten months of 1318 had taker out of you o time pursuits over two

of 1315 had take; out or feet time presents over two and equerter mills a rea at women and placed them in industries manufacturing supplies and ammunition for our crimes at large and abroad which same the signing of the armstire had been placing in auticible employment and a range of 100 000 men and women a week inust immediately reduce its machinery from 750 branch offices to approximately 56 and its personnel from

nearly 5 000 employees to 1 000 By March 14th the Conneil of National Defense announced the furnation of an emergency committee to find employment for soldiers and sailors with Colonel Arthur Woods as chairman

On the same day a telegram was sent to the Governors

of each state and the mayor of a large number of principal cities asking for cooperate talegrams began to pour in both to the Council of National Defense and the U S Imployment beryice from governors mayors organitations and private in-dividuals containing pledges of support and advices of immediate action tending to support the Federal Limploy-ment Service until on March John 22d, В 22d, John B Densino Director General of the U Employment Service was able to pseud a statement in which

"In addition to the 56 offices which the icderal Imployment Service had arranged to continue approx inately 250 more nearly half the total number stated for closing today—are as-sured of continuance for the I mployment Service by contributed funds and personal

The 2000 Thergency Bureaus for Returning Soldiers and Sailors I merganery surpress for feederming counters and established the attitutus of the U.S. Employment Service in the demohilization camps and on the transports will also be continued at full blast. This plodges of outside funds to keep the service going until Congress assembles from the breasures of states with a clumber of conference and the control of nerce labor and welfare organizations and other volun-teer bodies already amount to bundreds of thousands. The welcome which the inter-departmental committee

known as the I mergency Employment Committee which are introsted in the problems of labor and con-pl yment—received from the press and the country at has demonstrated clearly the need for some s orgunization to act in a purely administrative capicity at I place believed the I ederal Employment Service at least for the present emergency the full strength of all government if machinery

Ih personnel of the committee is satisfying and com The records for performance of its individual members guarantee the carrying out of any task to which

he selecting ( 1 Arthur Woods as his special assistant in employment n tt rs and to act as chairman of this committee the Secretary of War has picked a man whose reputation for efficiency integrity and inspiration is

A New York newspaper man is describing him said

He was the best Police Commissioner New York ever-liad Mention has named the Rew Yorker and the reply almost instantly is Oh, was mean the Police Com-

nsconer The position of Police Commissioner of New York city has been the grave of many a shining reputation, and destr yed forever the hopes and aspirations of more than one incorruptible man. Woods success was due solely to his policy of the square deal in its broadest sense his first announcement was Any patrolman on see me personally, at any time and talk over his troubles but the patrolman's friends can never see me. He hard up to this policy to the letter which meant the named at abolition of politics in the department. The effect on the morale of New York s 10 000 policemen was effect on the morase of New York at 10 up point men was unabulable and he left the point of rec the inset and best disciplined body of mailoramed men in the world It will not be any part of the work of the I mergency Imployment Committee to creat maintain or operate under its own administration any employment ma-chinery to substitute that which already exists

Its first duty is to gather the fullest information con-The first duty is to gather the fullest information con-training all earling agonous whether governmental or established and maintained by private organisations and individuals attudy their efficiency and find out just how the War Department and the committee can by copprating with the local agencies fulfill the nation s obligation to the men which it is now returning to civil

Its second duty is to find out how the government and



Scaled left to right-Mathew Woll American Federation of Lakor Fillott Goodwin General Secretary Chamber of Commore vote to the properties were among the properties of Labor 1 and 1 a

United States Council of National Defense's Emergency Employment Committee for Soldiers and Saliers

the Emergency Employment Committee can best supplethe Emergency Employment committee can best supple-ment and support the work of the U 8 Employment bervice and encourage cities and towns, through public and private contributions to carry on the bureaus for returning soldiers and sailors, and to establish similar

burn as where they do not exist in the meaning some they do not exist. Its third and perhaps one of its most important functions will be to determine to the fullost extent, the needs of the dascharged soldier salor and marine, and how best needs can be supplied. To do this work, plans how best needs can be supplied of the control of t information. It will be the task of this division to establish a personal contact between the man and the establish a personal contact to twent the man and the department of the government with which he may have to deal It has been proposed that this work shall be so complete that this branch will be able to answer any question regarding the status to civil life of the man eaving the service

leaving the service Thippopure of committee has already recover initiages of support and cooperation from all the recovery initiages of support and cooperation from all the service of th

that its obligation to the individual does not cease when he is discharged from the service

The instant response by the country to the preliminary appeal is clearly indicative that the nation—to pera phrase Victor T J Cannon, writing for "Carry-Oa" is going to fight for him today, as he fought for us yesterday, that his tomorrow may be worthy of us both.

#### The Current Supplement

FROM time to time articles on the so-called "Sying I arckness have appeared in the newspapers and magazines It has usually been suggested that this sickness hinged upon a failure of the human mechanism properly to adjust steelf to the change in pressure involved in passing from high altitudes to low or receive in-volved in passing from high altitudes to low or receivers, and that accordingly it was in a way analogous to bends and other caisson afflictions. That this is utterly fallacious is the thesis of the author of Figure utterly fallactous as the thesas of the author of Flynns, Nucheas in the current SUPPLIMINT, No 2260, for \(\text{lpri}\) 226th, and an excellent case is made for what this cuprenced avature regards as the true cause of the malady. In the chemical field is presented a translation of Protissor Mourdo's recent address upon Inorgenic Complexes in which much of intreet alike to chemist and to layman is said. Wafer Power in Cellyferns discusses the position which this state occupies in the pre cusses the position which this state occupies in the present and potential development of the factor in fuel conservation. Degrees of Permanence in Photographic Prints makes plann what can be done in this direction and how, and what cannot be done and why not. The amateur will find it instructive, and the professional will we to admit that at the very least it is interesting

excellent account of the letest development in mechanical handling of materials is given in The Portable Scoop Conreyor An investigator into growth contributes an ad-Apparatus for Growing Crystals Under Control The History of the Cattle-Tick ment has done to eradicate this dangerous peet and the measure of success that has crowned the efforts. The story of Radio Telephony runs through its second install-ment, and will be concluded third part next week In addition. various shorter articles of value will be four

#### Composition of the Atmosphere of the Soil

FROM 10 to 20 per cent by volume of the soil is composed of air, but this "atmosphere of the soil" differs from the superficial

atmosphere in composition able The percentages of its constituents vary likewise from season to season Recent investigations of this subject by two English scientists. Messrs Russel and Appleyard at Rothamstead in England furnish some interesting data To a depth of of one of the soil atmosphere is very smiller to that of ordinary air, though containing a little more carbon dioxide, but the total amount of carbon dioxide plus oxygen is less than in the air During periods of active

coryen, the than in the most burning to the depth of the precision of original distances and this is one of the conditions which characterises the so-called "awakening" of the earth in spring. Besides the atmosphere entangled in the intersities of the soil there is a certain amount of air dissolved in the water and the colloids the soil contains, but this is the water and the colloids the soil contains, but this is the water and the colloids the soil contains, but this is the water and the colloids the soil contains, but this is the water and the colloids the soil contains with the property of the soil increases with the water and the colloid the soil increases with the water number of the soil increases with the suptaintosphere is renewed by the rain. This fact indicates that rain is supernot to irrigation. As might be actions the soil increases which was the soil increases that the soil increases with the water and the soil increases that the principle of the soil increases that the soil increases with the soil increases with the soil increases with the soil increases that the soil increases with the water and the soil increases the soil increases that the soil increases the soil increases that the soil increases the soil increases the soil increases that the soil increases the soil

## Supplying the British Farmer with the Sinews of War

How Inadequate Supplies of Labor, Machinery, Seed and Fertilizer Were Stretched into Sufficiency

By Major H. Bannerman-Phillips

THE problems of administrative organisation of the messis for increased food production, and of a sufficient land supply for the carrying out of the program, have been designed in a previous article, in which it was shown low they have been solved. After this, the main contract have been to secure an adequate supply of labor, cerus nave been to secture an acquire supply of lator; to lanreace and properly mobilise the supply of horses and agricultural machinery, and to obtain and distribute a sufficiency of seed and fertiliser. In July, 1914, it was estimated that in Great Britain the number of men regularly employed in agriculture

was 800,000, while the number of women was 80,000, and that, in addition, 120,000 men and 50,000 women were employed at casual agricultural labor Hy January, 1917, the number of men had fallen to 562,000, and as 1917, the number of men had fallen to 062,000, and as there then remained in agriculture 177,000 mes of military age and 118,000 under 18 years old, it appeared that additional large numbers would have to be lost Further inquiry had hrought out the fact that the system of voluntary recruiting on the one hand, and the action of losal tribunals on the other, had resulted in an action of local tribunals on the other, had resulted in an unequal distribution of farm labor for far as was possi-ble, efforts were made to rectify this inequality by limiting the demands of the War Office to particular areas Owing, however, to the urgancy of reserving labor for carrying out the extended tillage program, it was finally decaded in June, 1917, that no agricultural labor might be recruited in Great Britain by the War Office except with the consent of the Agricultural Executive Committees in England and Wales or of the Board country Committees in England and water or of the Board of Agriculture for Southand Meanwhile, the War Office had taken stops to assist the Boards of Agriculture in England and Soutland by placing at the disposal of the Executive Committees a considerable number of skilled Fixecutive Committees a considerable number of skilled plowmen and a still larger number of unskilled workers in the spring of 1917, 21,000 plowmen and 19,000 other laborers were lent for agricultural work in England and Wales The bulk of the skilled plowmen were lent only

for eight weeks, but the seesstance proved invaluable in carrying out the sping tillage. In Seviland also 1870 men were loaned flow the aims to assut in the spring cultivation. During the year, also, the War Office provided labor to new-t at the hay an I corn harvests and close on 40,000 m n have been made available in Fingland and Wales and 1,000 m to folland. The War Cabmiet also desided at the end of June that preusion should be made during the summer for the rele for agricultural operations during the scason of 1917 18 25,000 men experienced in agricultur or used to horses and 25,000 unsalled meis. Up to the middle of December about 35,000 men had been made available

In addition to the supply of military labor special efforts were inade to securathely of women as workers on the land An active recruiting campaign was undertaken and provision was made for truining workers by means of short courses at colleges, institutes and on the farios Complete returns of the number f women completed in ulture are not available but it is estimated that 270.000 women are now employed as permanent or anyone women are now imploved as permanent or temporary farm bands. This capanison is largely due to the work of the voluntary organization of the Women a War Agranultural Committees village. Registrars and District representatives, and have been greatly helped by the appointment of group leaders with technical knowledge who have organized gangs of part time village workers all over England Women have proved in farm work, as in munitions and in many other occupalarin work, as in multitions and in many other occupa-tions, how great is the service they can rinder to their country in war time. Squads, also of boy labor from public and secondary schools of the country were organ-ized in vacation and have contributed to the successful results of last summer. In addition to these supplies of home labor, 4,500 German preseners have been em-ployed in competion, with accurate the supplies of the supplies

ployed in connection with agricultural work.

The second requirement for the program of increased tillage was the provision of additional mechanical power.

for the service of agriculture is well as an increase in the number of horses Steps were promptly taken to mobilize the existing supply if tractors and steam plows and to provide for an in reused supply at the carliest possible date. This task was the more deficult because, on the one hand almost all the agricultural implement on the one mand infinest at a agricultural implements makers had been engaged on the minofacture of munitors while on the other hand the importing capacity from America was limited. The suitability of different types of trustors was carefully tooked and finally it was decided to concentrate the main effort on the American machine the specifications for which were generously placed by Mr. Henry Ford of Detroit at the disposal of the Butish Covernment—It had been intended originally to manufacture these tractors in the United Kingdom, but it was found more speedy delivery would result if they were made in and shipped from the United States Dehvery commenced on January 1918 on a program calling for 1000 machines in four months, and orders given for other makes insured that 7 000 Government tractors of one type or mother with plows and other tractor implements would be available to assist in work

for the 1918 harvest in Great Britain and Ireland Another important factor is the use of steam plowing sackit Owner important nature of ishor and lack of repairing facilities, the steam plowing facilities the beginning of 1017 was not bring used nearly as effectively as it should have been flowed difficulties were largely overcome by the release from the army of men experienced in steam tackle work and by arrangements for repairs so that at present all the sets of tackle in this country are being put to effective use. By the beginning of October, 1917 the efficiency of the steam oeginning of October, 1917 the efficiency of the stram plowing plant, so measired by work done, had increased by 65 per cust over what it had been in the period of spring tillage Arrangements had also been made through the Ministry of Munitions for as many new sets

(Continu d on page 442)

## Correspondence

The editors are not responsible for statements made in the correspondence column Anonymous commualcations cannot be considered, but the names of correspondents will be withheld when so desired

#### Dynamite and Fertilizing

To the Editor of the SCIENTIFIC AMERICAN

An articleappearing in your wave of February 8th under the head of "Dynamiting Devastated Orchards in France," etc. has attracted my attention because a French Horticultural authority has laid before the French French Horticultural authority has last before the French Academy a paper making oldsum that dynamic year an important factor in saiding the fortility of orchard soils, "due parity to the fiscursation of the soil, and parity to the impregnation of the soil with nitrogenous subjects," He makes mention of the fact that the dynamic is to be used "in conjunction with a suitable amount of tenji-ser in a container surrounding the explosive fit sign), a way that the force of the explosion would drive size of the force of the explosion would drive size of the force of the explosion would drive size of the force of the explosion would drive size of the force of the explosion would drive size of the force of the explosion would be supported as and suffur, makes it unnecessary to go any tubble it adding the fertilization by blasting, than to just use six

dynamite alone
In the use of any supplemental fertiliser surrounding a dynamite charge, there is an effect that the advocates of that method seem to lose view of, dynamite in detonation that method seem to here view of, dynamite in detonation and method seem to here, and though the force action and ment instantaneous the heat is a quick, the fertilines currounding the dynamite obstage in the soil is partially burned, and its benefit than must occur from its change to the soil in partially burned, and its benefit than must occur from its change to sel, and is spacelly the same method that the dynamite slone produces plus the mechanical action of widely opening the soil for the gases that follow? The first use of dynamites in adding the serifity of the soil is on, report as having been made in Austria. The grown of fights decidency and citrus fruits on the Peanfo Sispin and Coast have finded use of dynamite in the Peanfo cimary years, and where soil confidence see such that a benefit can be realised, that benefit is wonderfully mani-

fest in the growth of the tree and the quality of the fruit thereof. This knowledge is not so in wa thing, when it is remembered that its fifts, record of use bears the date of 1870, or theresbout. That it has not been widely adopted in due to the fact that in some cases it has been improperly used, and the benefits even go further than another a state to the case as a second of the collection. giving a return to a young or new orchard, it will revive old trees where the work is properly done, in a manner

It is to be borne in mind that the greatest benefit

It is to be borne in mind that the greatest benefit realized from blasted orphard suits follows where the blasting is done at the very driest period of the year "fineutiation is then the greatest thus fitting the soil for the widest possible benefits from the blasting. The question arises, "flow does the dynamite become a fertilizer?" Something over 70 per cent of nearly all high explosives is nitrate and suffur. When these are changed from solds to a gas, through explosion in the soil. changed from some to a gas, among the fissures made, the gas given off passing out through the fissures made, produce an oxidation that has an affinity for the free nitrogen of the air, and the blasted soil acquires thereby nitrogen of the air, and the biasted soil arcquires thereny from the atmosphere a larger portion of that swent tons of free nitrogen, said to overhe overy square yard of the earth's surface, therefore, the soil is enriched. It has been the observation of the writer that the effects of peen the observation of the writer that the effects of blasting are vaible for a number of years, in butter growth of the tree, and a higher quality of fruit. The blasts give best result when placed at a depth of 48 inches to 54 inches

Seattle, Wash

#### The Fertilizer Cartridge

To the Editor of the SCIENTIFIC AMERICAN
In the issue of February 8th, the writer noted with
much interest the description of an idea much the same much interest the description of an dea much the same as one employed by me, in a cartridge containing forti-isers and dynamic The ultimate am of this cartridge is for soil cardinates, medication and involvablesh, and is for soil cardinates, inside a containing the car-necte, by analysis, I have but taken advantage of a stitutifien always set, the separate use of dynamic and the very subcossful usel of fertilisers on the surface This makes as tempolyfales and direct way of feeding, or the treating of trees for their ills through the devolution Medical One.

Medford, Ore.

#### A Great Piece of Executive Work

To the Editor of the SCHATTER AMARICAN I was interested in reading an article in a recent issue of SCIENTIFIC AMERICAN on Edgewood Arsenal, Mary

We are interested in this article because of the fact We are interested in our article locause of the construction and operation of the chlorine plant which was built at Edgewood and were entirely responsible for all of this

I wish to state that your commonts on the work of Col William If Walker do not really do him justice Colonel Walker took hold of Ldgewood Arsenal when it was in a most chaotic condition and straightened all matters out and he got the personnel working as one matters out and he got the personnel working as out unit. He did the greatest pilet of excultive work that I have ever had the pleasure of being associated with Samuel M Green,

Springfield Mass

#### The Automatic Shovel

To the Pditor of the SCIENTIFIC AMERICAN

In your publication of February 22d, an inquiry is published from W E. Abbott, Murrulen Wingen, N S. W in regard to a digging machine to be operated by the weight of the engine

efore this war I remember having read a deperfore this war I rememoer having read a description in one of the technical monthlies published in Bohamia of a similar machine of a Swiss invention, operating on the same principle of weight of the engine, it works very successfully and a revolution in cultivation of lands has been promised by this machine

On a great cylinder similar to those used on some tractors as a back-wheel a row of spades are attached adjustable to any desired depth to dig in the soil, the weight of the whole machine forcing these spades in the ground and automatically turning it over by the forward movement of the machine. I never noticed anything on this continent of such an invention and it may be interesting to the farm implement manufacturers to investigate and construct machines of such action

s claimed that such a machine works faster and better than any other plowing outfit for great or small

AUG FINIGER

Winnipeg, Man



Automatic pyrometers and signal lamps on the heat-treating furnaces in a steel mill



Seven pyrometers which record on one multiple chart, under the control of a single operator who works in a quiet office

# Weighing High Temperatures in an Electric Balance

A New System of Pyrometry that Gives Better Control of Heat Processes

By J. M. Bird

Till manufacture of munitions has brought about a great extunoum the pract to of heat traiting metals which in turn has resulted in rapid development of that art. In particular, it has been demonstrated that a prerequisit to success is ability to gag, with recursey the temperatures employed. Consequently much at tentron has been divorted to the instrument which I obtaining that it from the themometer in its ability to me surretemperatures running up into the lundreds and even thousands of decrees is given the special name performeter.

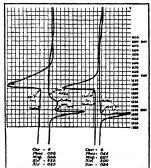
temperatures running up into the unioneous and even thousands of degrees is given the speculi many promoters the thermocouple line coin onto almost universal has been compared to the control of the con

tools so that the two forces oppose one another in the circuit formed by the two pueces.

Under normal irreunstances of course nothing happens. He two forces are equal and opposite they balance off exactly and there is no current through the couple. But it happens that the force generated at either junction warns with the temperature at his tenth of the control of the couple of the control of the control of the couple 
Dynamic montree force may be measured by the strength of the current it produces A coil or winding in linded in the it that it produces A coil or winding in linded in the it that it is suspended near a permanent magnet in such way that the coil or the magnet can move under the influence of the magnetic force set up by the current flowing through the coil. But the force then exerted depends upon several flat tors—the electromotive force they are the total at the coil junction the resistance of the circuit (including the the ranscrape), the lead-wires and the galaximum (i.e. coil) and the strength of the magnetic field. More over the force is usually measured by permitting at to twist or both all a pring included in

the suspension—and the displacement then depends upon the peculiarities and the condition of the spring quite as much as upon the force itself

Changes in any of these factors will affect the result to its necessary when using this method to provide a constant cold-junction temperature. This can be done by means of a steam box an insulating packet, or by burying the cold junction deep in the earth—which is not as inconvenient as it sounds when we consider that



( urves for transformation points of two different steels, showing in each case the heating curve and the cooling curve

the two elements of the thermocouple are frequently series of indefinite length, juned at the ends It is necessary, also, to elements the effects of changes in the custance of the thermocouple, and the lead-wires by issue a galvanometer of high resistance, which would swillow up any changes in the low resistance montioned, and it is mesessary to guard segund physical changes in the galvanometers themselves by frequent calibration But unfortunately high resistance in the galvanometer

necessarily implies small current and correspondingly small power available for the operation of the instrument, in other words, greatly increased delicacy and liability to derangement

An alternative to this a rice of complications as afforded in a recently developed system of temperature control, using the potentionicier. This instrument is the helerical equivalent of the weighing balance. With balance scales, measurements are made by applying variable known weights utility equal the unknown weight. When this occurs, the scales stand at zero, in either pan, they are then and to be balanced. In quite the same fashion, measurements are made with the potentiometer by balancing a known electromicity force against the unknown when they are equal, the index of the instrument a gal anometer needle, stands motionless as it is alternately thrown into and out of the dreunt in the ones of the weighing scales the variable known weights are extirned units separate from the scales the potentioneter provided reasons.

the instrument a gal-anometer needle, stands motioniess as its alternately thrown into and out of the dreuit. In the case of the weighing scales the variable known weights are extraind inits separate from the scales the potentioneter provides its own variable known of the control of the provides of the variable known of the control of



Pyrometer equipment on a heat-treatment furnace of a different type



The recording apparatus that controls the steel-furnace installation shown at the top of the page

heen introduced into the circuit HDGH to offset the force created in the thermocouple

creases as the common opportunity of the thermocouple, this galvanometer, nated of measuring the actual electrometric force, in used merely as a current detector to show when there are occurrent forcing, that the state of the thermocouple, or of the lead-wires, or of the galvanometer, or as to the strength of the magnetic field or the spring tension of the galvanometer, are eliminated, one of these tens has any offect whatever upon the saccuracy of the matrument.

As the length and the resistance of the fead-wires do

As the length and the roustance of the lead-wurse do not master, many different thermocouples can be measured at one central statuon by one operature and one potentismeter, regardless of the distances soparting the couples from the central station Morouver merpensare base-metal thermocouples can be used instead of the society platinum couples, for while the reastance of the base-metal couples in not so constant as that of platinum couples there constants of electromotive force which pyrometry is based in quite as great. Thin with base-metal couples in clud wires can be made of (Constant on page 41).

#### A New Process for Drying Food

THE arguments in favor of delaydratum of food producle are all in and it is to be assumed that they are now sufficiently familiar to us all to make superfluons their repetition here. The verdit seems to be that delay dration has come to stay and that its viry general uswaits merely upon the development of the no essary machines and the nocessary readjustment of the channels of commercial distribution of food.

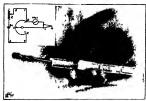
The first of these tions is the one which has received

The first of these items as the one which has received the most startunion, because it naturally comes first. The intangible mechanism of distribution is not going to be modified to give the drier as source of supply of green foods and a market for his waterless product until the tangible machinery for doing the drying is on a basis which will attract capital. We have already discribed in those columns at least two installations for removing the mosture from fresh vegetables and we have pointed to that the one was the logical outcome of the other line the first, are was passed over the material at a temperature sufficient to bring about drying. In this second, the progressive principle of operation was added to make the proper of the outside the progressive principle of operation was added to make the proper of the outside the time that has was an unprovement which would go far forward putting dehydration upon a level of commercial success.

signs a level of commercial success. A group of investigators at Columbia. University beaded by Prof. Ralph H. McKee has been at work for some months on a drying system which marks a branching out in an entirely new direction. The idea behind this undertaking is that the use of the air current should be abandoned altogether and the drying carried out in year to be a great the state of the continent of the state of the

One of the advantages to be derived from successful execution of this idea would be a greater measure of cleanliness, if we are not going to pass a current of air over our food, we are at once discharged from all concern

as to the germ content of that ar Then, too, the aricurrent system can be a real success on progressively, and that implies that the material under treatment is adwanced from one chamber to another wanced from one chamber to another cordingly we get away from a low take up a grocess which is real way from take up a grocess which is real way from take up a grocess which is real way to real manufacture of the raw maserial in one place and leaving place and leaving treatment of the processing the conpleted Mercover, its



A thermocouple of base metals. The insert shows the wiring scheme for the potentiometer

process under uniform sonditions, so we have only one sof of conditions to study and regulate instead of many such sets. And since, we have replaced the principle of the size current by the principle of waxenim we have climinated the endition of humidity such stituting for it the condition of pressure and the extension of the condition of pressure and the —especially when it is necessary to make the former variable

The work of Dr McKee and his associates would have been materially samplified had they been content to



Vacuum-dried meat, and the water that came

attack the problems of vegetable drying alone. But they were eager as already suggested to extend their nethods to the drying of meat and fish, and this in troduced some very special and very trying complica-

What one of these is ean be seen by considering the case of a hard-boiled egg. If dried must is to seer, any conspicuous success, we must be abit to any of it as we have so often said of vegetables dried by one process or an after, that the cellular structure is unimpaired that with the absorption of water, the dried product be comes

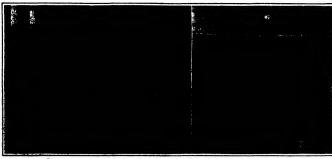
again just like the fresh and when cooked and e tenlooks and tastes and smells just like the fresh. Now when an excus build hard, the allumen becomes

familiar.

As and difficulty has to do with another fundamental component of the met. It was found in an early stage of the experiments that in our rapect various driving was far superior to an drying, alice for means and for expectable. The lon-recitational finite interior tearns off the water recording to whe hit it also carries off a good part of something desertly presents vitamine about which we talk to much nowndays and know so that begins to the begins of the water recording to when the water resorted in the superior tears and the stage of the water recording to when the water recording to which water recording to when the water recording to which we want to be water recording to when the water recording to which water recording to when the water recording to when the water recording to which water recording to which water recording to which water recording to when the water recording to which water recording to which water recording to when the water recording to which water recording to water recording to which water recording to water recor

Before the vacuum drying process can be considered as even on the road to success these were conductions must be met. We must find some way to regulate the temperature and the degree of vacuum not that the albumnas will not coagulate and the fat will not fry out. There price the business is not vet in extre which would warrant the Columbia chemister in telling just how they have met them though the temperature of the chunke in an ordinary. Insile with every trace of water has been chimin stell but which every trace of water has been chimin stell but which every trace of water has been chimin stell but which every trace of water has been chimin stell but which every trace of water has been chimin stell but which every trace of water has been chimin stell but which as stellar from their dryings out that some of these pieces are real with the grain and streak of fat just as Nature made, them. They point that some of these pieces are real with the grain and same text set it indicating that it makes no different how the coverage of the control of the most coverage for the most event of the control of the control of the decision of the process cancer that the process cancer that the control of 
We have indicated that the details of the process cannot be made known as yet a very the very go ard one on which we have already divided that it is a vacuable process. He is not other inter-sting feature which can provide the process of the process of the process. It is a pump and for run a pump requires power. One and the process of the star mortical and it was all the process of the star mortical of we will run our pump by steam we shall have exbances therein with a 1st of heat in the cannot he had to fact to git us all the temperature we need in our vacuum Professor Me time plans are all worked out for

brating his material by means of a packet employing the cyloud steam from his pump. In the small example, the cyloud steam pottine crital method with which he has citred out he has citred out he has citred out he has not been able to put this mito practice because in this apparatus in trush so not been motor and as some one has remarked in the properties of the historial properties of the historial properties of the hitther common where common where common where common and the common which common and the c



Preserved a tray of ment for the vacuum drier, and a climpee into the interior of the chamber



Army 14-inch gun, shell 1,200 pounds range 19 miles. A massive cast-steel turntable transported, in sections, with the gun, can be laid in seven hours. The gun and carriage are transferred from the trucks and the gun, as here shown, is ready for firing

## America's Great Effort in Ordnance—II

The New Proving Ground For Testing Army Ordnance at Aberdeen, Md.

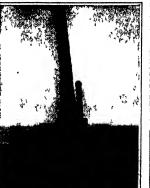
I N dealing with the production of artillery in the time! States during the war critain conditions must be kept will in mind. It should be understood for instance that the calibors which had been in use before we cutzred the war were our old type of 3-inch and 6-inch field guin. When after del ate, with allied commissions we entired the war were our out type or grace and some field gam. When after det atte with siliced commissions it was decided to use I reach amounts on it was necessary of course to adapt the calibras of our guns to the French type of projectics. Intail is 1 yas we had I to change our 3 inch to 75 mm bere and similarly the Grack to the 155 mm It was not until August of 1917 that this aon min at was not until August of 1917 that this decision was made but immidiately contracts were placed for many thousands of 7-min 195-mm and 47-ninch guns Consideration also had to be given in the matter of the contracts which had been catered into by American manufacturers with the British 6 sycrimioni.

American manufacturers with the British Gavernment because a stopping of work on these contracts would have meant a grat handrap in the delivery of badly-moded field ordinance to the Allersa article (Scientifica Lordon and Carlos and Carlos article (Scientifica Lordon and Carlos article (Scientifica Lordon and Carlos articles (Scientifica Lordon and Carlos articles (Scientifica Lordon and Carlos articles articles and Carlos articles (Scientifica Carlos articles and Carlos articles and Carlos articles and Carlos 
| 3-mch I reld Guns (75 mm.) | 1 862 |  |
|----------------------------|-------|--|
| 75-mm A A                  | 66    |  |
| 155-mm Gun                 | 213   |  |
| 155-mm Howitser            | 796   |  |
| 8-inch Howitzer            | 121   |  |
| 9 2 mch Howitzer           | 40    |  |
|                            |       |  |

It should be made clear that aith igh in order to save shipping space and to expedite the equipment of our armies, we availed ourselves of the French and

British offer to equip the first 2 000 000 men we sent over, we at once enlarged the country a facilities for the manufacture of propellates, high explaints and overy character of ordnance and placed enominous orders for the various types of field guins. I he orders and acceptances

| of field guns were as follows                |         |          |
|----------------------------------------------|---------|----------|
|                                              | Ordered | Accepted |
| 75 mm American 3-mich A Λ French and British | 11 745  | 2 395    |
| 47-inch A A                                  | 1 597   | 211      |
| 155-mm Gun                                   | 2 161   | 184      |
| 155-inm Howitzer                             | 3 000   | 1 579    |
| 8-inch Howitzer                              | 235     | 195      |
| 210-mm Howitser                              | 1,160   | 3        |



A five-luck gun on wheel mount

N.J. A. Stell

at ADECREEN, Md.

It is interesting to note that figuring the elapsed time between the cutrance of Great Britain into the war and an equal time factor with h considers American production, United States production of mobils artillery reached Great Britain's hyuren is period of 19 months. Looking Great Britain is hyuren in a period of 19 months. Looking Great Britain was already quipped with great ordance factories it is proved that figuring from that time of entry into war. United States production equalled that of Great Britain in a period amounting to two months less than it required Great Britain to accomplish similar results. Notice, too, should be taken of the fact that the United States furnished to Great Britain from 1915 on during the period of the war a total of 1380 gues of calibers varying from 3-inch up to 8- and 9-3-inch. During the same period the United States also furnished Great Britain a total of 114 gun carriages Incidentally, too, the United States (unished to Great Britain at 143 300 000 obtail of various calibers from the field gun up to 12 and 15 inches

Necessity for the New Proving Greend

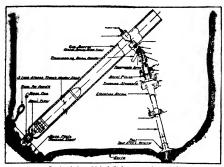
Necessity for the New Proving Greend

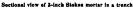
Necessity for the New Proving Grou The necessity for the purchase and development of the great proving ground at Aberdeen was found in the fast that the famous Sandy Hook Proving Ground, established the famous Sandy Hook Proving Ground (1998) and the famous Sandy Hook Proving Ground (1998) an lished in 1874 was altogether inadequate to meet the enormous demands imposed upon us by the great war eatermous demands imposed upon us by the great was Sandy Hook a narrow pennisula five miles long, was and continued for many years to be fairly adequate for the ordinance of thost days when the largest gun was the 15-inch Rodman amouth bore, and rifled guns were the 16-men rooman smooth over, and rined guns were being experimented with and high explosives and smoke-less powder were unknown Ranges were extremely moderate judged by present day standards Indeed, a letter from the commanding officer, New York Arrean! to the Chef of Ordnance in 1874 made

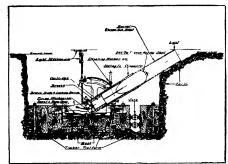


Many of our oider 35-cal 8-inch guns, good for high-angle fire, were placed on railway mounts. Note the lateral struts for steadying our against the recoil

One of the French type, 185-mm. gans







Foundations, etc , of a 240-mm trench mortar showing the shell

this interesting statement Ranges from 1 700 to 2 000 yards can be readily obtained on this reservation (Sandy Hook), and if deemed important these distances can be considerably extended within the limits of the reservation.

ration." The necessity for such a vast proving ground at Abardean will be understood if we consider the volume and diversity of the work done there. In the first place every new type of gun, gun carrage, projectile, explosurings, and a hundred other dovines pertaining to ordnance, must be rigidly tested at a proving ground before it can be approved for general use. The necessity for making dangerous things safe to handle requires more prolonged and careful testing than is the case with most manufactured articles. Thus, to test a nagle type of gun carrage alone, 0,000 shots were first at Abardean Many thousand rounds are required to test even a single-design of fuse.

design of fue Again, a sample of every lot of ordnance material manufactured must be tested to determine whether it conforms to appendentents. However reliable a manufacturer may be soldiers lives cannot be repartited by allowing possibly defective ammunition to go untested. The proportion of manufactured ammunition steeted is small, usually one-tent hot one per cent but every gan and carriage must be put to the proof individually. Thirdly, the divensity of the activities and the necessity for their freedom from dangerous interference with

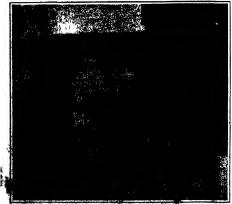
sity for their freedom from dangerous interference with each other were of great importance in demanding the large area purchased as will be shown by the summary



Aberdeen proving ground, area, 35 000 acres, length, 15 miles. Note observation towers, on eastern shore, to plot the fall of shells

The proving ground includes a trench warf ire range where a large volume of firing it short ranges wont on a main battery where non-explesive projectiles were fired main battery where homeopies we projections were more to test power and guns a water range where the splashes made by falling projections were accurately aported by observers several detonating ranges where officers watched bursting shell from bomb proofs close to the line of fire and recovery fields where shell fired in the morning could be dug up in the afternoon Then in the moraing could be dig up in the afternoon. Their an avaition field with hanges and shops a boming field where avaitors could drop explosive bombs and an anti arraft fining range were needed. All these wire artually provided for in the Aberdeen reservation and Compowder Neck was still left for the gas plant. However no room could be found for a firing range for teving gas shell and a new Proving foroutal had to be celablahed at Lakeburst for this purpose. The contract of the street of the country for shell in the country of the country

Consideration area wint a constring guil or a major entirer, shell airsking an armor plate may project a fragment to the distance of a mile. Again a high explasive shell may receive to a risking the ground and be deflected far to one side of the point asmed at While it is possible to crowd Prusing Ground settivities togs their to a dangerous degree the lives of persons outside the grounds should be protected and so a neutral zone must be maintained inside the b undary
(Continued on page 4-8)



Parting Palastic Madein morear by Bropphis the abolis in at sussale



Loading the bomb into a 240-mm trench mortas





The main dining room of former days is now used as a motion picture theater and recreation hall

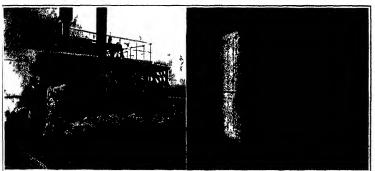






The enclosed promenade deck of former days is now fitted with folding bunks

The only place where the

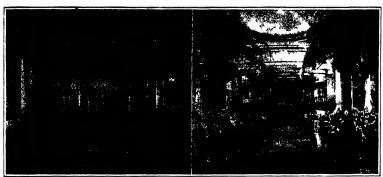




The greenhouse which furnished fresh flowers for the dining tables of the Vaterland is now alled with the flower of our navy

to grout frepisco now a louis





ig room of the Vaterland"

The officers dining room and motion picture theater used to be the Paim Garden Tea Room of the Ritz Cariton Restaurant





r old name remains

The old awimming pool is now floored over and filled with folding bunks





fing spot for our salles

The busy office of the chief executive officer of the Levinthan" used to be the Vateriand a library

# What is a Man-Hour Worth in Your Plant?

To the worker at the machine, the value of a man-hour is one thing—to you, as his employer, it is another.

The value to him is fixed by his pay check. To you it is fixed by what he produces in that hour—and these two values must be in proper relation, one to the other.

That is why manufacturers today are busy on the problem of increasing man-hour value to them. They cannot add to the hour—they must add to the man.

How? Not by increasing his burdens, not by a driving effort, but by the one way which is logical—increasing his efficiency.

Few things are more important here than the character of the power that turns the wheels and the way this power is applied.

When electricity is harnessed to the modern machine tool, the value of the man-hour at once takes an upward bound, because electricity is the one form of power with which a lathe, a drill, a grinder or any other machine may be run swiftly for this task, slowly for that—always at a speed correct for best results. Moreover, every machine

can be placed in the spot most convenient for production. Another important factor is the elimination of belts, which makes effective artificial lighting much easier.

Westinghouse Motors have taken a conspicuous part in multiplying the value of man-hours in thousands of manufacturing plants in practically every industry ever since the day, over 30 years ago, when the electric motor was first applied to industrial machinery. And not only did Westinghouse introduce the Alternating-Current Induction Motor, but the Synchronous Converter as well, so that alternating and direct current became available from the same supply line.

ESTINGHOU!

In applying motors to so many industries Westinghouse engineers have learned not only the power requirements of this machine and that, but the principles and practices of thousands of industries. When you buy Westinghouse Motors you buy not only machines well built mechanically and electrically, but service that can be offered only by men as thoroughly experienced as are the engineers and industrial specialists whose counsel and advice are always offered to the purchasers of these motors.

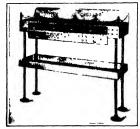
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
East Pittsburgh, Pa.



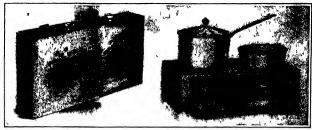


### Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts



Insurance rates are materially reduced by the installation of this stove abourd yachts



Using solidified alcohol as its fuel, this portable stove is ideal for picnics, camping, beating, and other purposes

### New and Novel Uses for Solidified Alcohol

FUFL for heating and cooking purposes in the trenches and in the field was one of the great problems confronting our Army in Trance. Someone suggested fronting our Army in Trince Someone suggested solidified alcohol which is safe and convenient to handle, and burns without all rer smoke. Immediately the vist possibilities of solidified all hol us a fiel

for soldiers became obvious and soon this material was being produced by the tim for the Ameri an troops in France As a result huge factories were constructed for the production of this novel fuel

the production 1 this hove the With the signing of the armistic and the gradual reduction of the warring armine new uses have had to be stught for the vast output of solidific lake had And the man who did s much toward the application of this fact to military life by such inventions as the mess kit stove sirplane fued carrier hospital sterilizer sirpian fuod (Arrici I isquital sterilizer dugont heater and other device already described in these columns has now turned his intention to more extensive applications of a stidified alcohol

The latest inventions of Mr 1 Papper of New York City are a most convenient form of portable stove and a special st ve for the galley of a yacht or small boat. The first of these is shown in the combined illustration both in the picked form and open for use. The stove is made in the form of a suitcase of heavy steel and is provided with a binged drop which forms

the front of the stave when it is creeted Folding feet beneath the stove serve to raise it an inch find a supplied in the form of cans which are placed.

be neath the lumrar holes. The second device is a special set we constructed anticely of administration and intended for use in bared you have an object and use and learned to the secondarie toff pm. Harry M. Be in net and metallich abound the youth. The Newmark with the smaller stowe the set we use a shiduled alloud in a new which we make stowed the set we use a shiduled alloud in a new which we provided the set when the secondary was the secondary with the smaller stowe the set we use a shiduled alloud in a new which was provided the secondary with the secondary was a secondary was a secondary with the secondary was a secondary was a secondary with the secondary was a s al ohol in cans which are provided with a shank at the bottom so as to fit int hils thus preventing them from slibing at out with the rolling of the be it A railing is provided to prevent pots and 1 ans from sliding off during rough weather A demount if k pen below serves to hold pots and dishes in the rather crowded galley. A for the heating projecties of the fuel it is said to be superior to most means of cooking. The flame of each burner can be regulated by means of a sample paddle-like member which serves to cover more or less of the can opening To extinguish the flame the paddle-like member is placed entirely over the can opening thus shutting off

### Portable Rail Sawing Machines

THE accompanying illustrations show a portable rail-saw developed at 5t Louis Mo Phese machines have been designed for efficiency durability and ecoomy as realized by track maintenance departments. The hand-power machine has a saw blide of a digneter

Close-up and action photographs of the portable machines for sawing rail ends

of 18 mehes the thickness of saw blude being  $\frac{1}{18}$  inch and the maximum depth of cut is 75% inches. The approximate weight of the hand power machine is 350 pounds and of the motor-driven machine about 450

The muchine is designed to cut iff rule at any angle

Copper bar Handle or supporting bracket.

New soldering iron copper bar makes contact with a larger area than the heating units could touch directly

Copper bar working end.



Soldering iron that heats the

with their length. The saw blade starts cutting in the center of the head of the rail and makes a true vertical cut at any angle leaving the ends of the rail perfectly cut at any ange leaving the chart of the tank of the same and the same

friction nut on the feed screw can be quickly released to feed the saw by hand through the web of the rail or in the return of the slide by means of a feed screw crank of the slide by means of a feed seroes crank • It will be moded that the saw blade as driven by an adjustable steel sprocket слеждид the periphery of the saw blade, mauring a positive feed The greatest possible capacity as thus obtained from both new and recut saw blades The pintograph shows the small nut necessary to hold the saw blade on its arbor, no large driving collar being necessary which would attack procket as adjustable capacity. The steel procket as adjustable care for worm out or recut blades. out or recut blades
I he motor-driven machine is suitable for

the motor-curven machine is suitable for cutting 135-pound steam rails, and any girder rail up to 7 inches high. By rever-ing rails that are out of track, after one-half of cut has been made, girder rails of (Continued on page 446)

### Suiting the Heating Tip to the Work

rail ends I Natempting to increase the rate of soldering the caps on the square tops of metal eartons used to carry bacut to the Army during the war it was found that the usual type of electric soldering row was not as effective as a newly invented baster which was developed as a result of the need for speed in this work. In this device a larger surface of the heated portion touches the metal of the carton and

less current is required than with the ordinary electric soldering iron. The design is radically different, the two design as radically different, the two heater untils being secured to the in-sides of two cast iron pieces, between which a flat har of copper about 1½ inches wide by ½-inch thick is clamped. This extends at one and and the heat generated in the flat heater units is transmitted to the copper bar, the end of which is the soldering tup and the heate up a good part of the metal carton cap at one time When the copper bar wears it is easily extended by unloosening the clamps and when not enough is left to be in contact with the heater units, another bar is put in to replace it.
This type of soldering device may be provided with a curved piece of copper instead of a flat bar to suit it to cartons of other shapes. A handle may be attached or a bracket for mounting on

# WALTHAM THE SCIENTIFICALLY BUILT WATCH







### Know the "Works" of a Watch Before You Buy It

THE watch presents the same elements of mystery that once surrounded the automobile Now, nearly every one knows something about a motor car's mechanism. It is to make the "works" of the watch an "open book" that these Waltham ulvertisements are designed to instruct and protect you in buying a watch

The mainspring is the power of a watch. It is a piece of specially hardened and tempered steel, about twenty inches long coiled in a barrel between the upper and lower plates of the movement.

It is subjected to virying conditions of service in temperature and tension. The variation in thickness of two one-thousandths of an inch, or lack of uniformity in hardening and tempering, will decide the time-keeping quality of your watch.

The Waltham Watch Company produces fourteen tons of mainsprings every year. It is the largest mainspring maker in the world. The Waltham mainspring is cut from long rolls of steel of uniform and special quality, then tempered in resilient form by a secret process, and is placed in the watch coiled into a hardened and tempered steel barrel. This process originated at Waltham.

The foreign mainspring is not only cut in short lengths, but hardened and tempered in short lengths—therefore every foreign mainspring is an individual spring of uncertain temper, making the watch a liability.

The foreign maker of watch movements buys his springs in the open market. That is one reason why the imported watch gives such varying service. An inferior mainspring me is an inferior watch—no matter how much you pay for it.

The uniform superiority of the Waltham mainspring is one of the reasons why the horological experts of the leading nations of five continents chose Waltham in preference to watches of any other make.



Waitham Colonial A
Litemely this at no sactifice of accuracy
Maximus movement 2 I sewels
Riverside movement 19 Jewels
\$135 to \$255 or rese

## WALTHAM

THE WORLD'S WATCH OVER TIME



Por clean fire lines, 2H-3H 4 fill-Porde care his tom, maps I are 7H-8H-8H

IN every profession, business and trade the Femous VENUS Pencils are minimizing labor and adding to the speed, facility and accuracy of the work performed by them, because each Pencil embodies Perfection

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American Lead Pencil Company 217 Fifth Avenue New York

n sure maxim mailer and no nom cost in safeg anding ele real cres to against and short circ. In Annespens r. Hong D. I. Renewall is real real who keep now Fuse to the original office over. The comparation of the control of the cont

ECONOMY FUSE & MPG CO Eliene and Orleans No. CHIC460 L.

Sie manufacturers of ARXLESS. the No.
agentable Passe with the 100 Committee I die

Economy Passe are also made in Committee.



FROM foundry to finish, the Bessener Oil Engine is constructed under one roof. From the chemical analysis of the pay from to the final assembling and test included the constitution of th

(nuch Selentras 15.10 180 H P. The Betsemer Gas Engine Co. 14 York St., Grove City Pa.

BESSEMER OIL ENGINES

### Recently Patented Inventions

Brief Descriptions of Recently Patented Mechanical and Electrical Devices,
Tools, Farming Implements, Etc.

LAMI CHIMNEY E B GODER Robustine Cills N Y This invention relates more par-titude to the means provided on the chimises of it is fremangement by the spring fagers thinks to the machine province on the entireds at (1 cas for engagement by the spring fingers usual) is which on the turner for retaining the 131 s. in position 1 he object in to provide in the to rective the fingers of the burner and out 1 is to entire the fingers of the burner and out 1 is to entire the fingers of the burner without about the apring fingers or burner any special control of the burner of the control of the burner and special control of the burner of the shall for the purpose

FIRETROOF DOOR -A C GODDARD OR FIRST ROOF DIODS — A C Gonzan care of III will blist de diduid Review Ave and Young St. Long Island (1); N.Y. The object of the Invention is to provide a frequenció doce which is invention is to provide a frequenció doce which is not islable to dissertion and sturshie in construction not liable to dissertion and ranged to prevent. Basses from reaching the interior of the sitle and raile in case of a fin a special feature is the use of course process of the situation of the sitle and raile. stiles and rails

sittles and rails BOWING ALLEY—W J BARRETT 500 I hostitut 9t. Brookin N Y I his investible relates to the construction of hosting alloys and has pasticular reference to means for affording invariance, and after jo the pilo hosy Among the objects is to so construct a lowling alley having two nurseys that one hosy may seally at both a te of pilos and to satisful the boy from the Sping pinor or bails.

DAVENPORT OR CHAIR -A E ANDE DANENPORT OR CHAIR—A E Amassacon and H Feruse 410 W intents. Recifered III. The invention relates particularly to the construction of development or chair ends the object being the provision of an end construction which will read the wind rame in this knows to unit dave post us or intare of light medium and nexty construction with the construction of the construction which will read to wind send to the construction which will read to the construction which will read to the post and the construction which will read to the construction and constr

COING DINT SEAI — I A LOWER 531
West Church St Jacksonville Fia This is vention r lates to joints between blocks of wall copluge the main object being to provide a



waterproof weal for such joints. The invention provides for a joint seal consisting of a blank of soft metal folded and bent to form a T shaped strip including a double-walled who depending therefrom the upper surface belong the convex insuring a permanent and waterproof joint.

permanent and waterproof John.

FLACH 14FF P. D. CRICKTON care of Howard 1 niversity. Washington D. C. The holyst of the invention is to provide a device having a mounting for the flag which is sitiable and pivotally connected with the staff in such manner that it is as a sing freely about the staff in the staff is provided with a fail lowering supported in staff is provided with a fail lowering supported. roller or drum freely rotatable to prevent wrapph of the flag about the staff

Mardware and Tools
VALUE TOOL—S. D. Haanno 462 Sharon
Ato. Zanewille Ohlo The object of this invertion is to provide a device for releasing motor
salve springs wherein a clamp is provided
having means for clamping the sides of the value



CARING IN SECTION

spring and the support under the spring and 233 Broadway New You Itasing a sliding clamp on the said means ad-Branch Office: 628 F Street Washin

FISHING POOL - A B HEATON, Coalings Out The invention has for its object to provid a tool expectally designed for insertion in a wid-



NGITI DINAL SECTION OF THE TOOL

casing to recover lost and broken tools whe muchanism is provided for firmly grasping tool to be removed prior to the removal of the and operabl from the top of the well casing

COMILTING MACHINE P Fama 22 South Recording N Y Among the principal objects of the invention are to ascertain rapidly the matin math at result of multiplication of one



number by another to provide a machine to assist dents and to simplify the construction and cheapon the cost of the machines.

cheapon the cent of the machines.

RAFETY (AAT 1P-P-P P Jians 444 E 79th 8t care of Jon Bory New York N T This inva 15 no has pa ticular reference to a gas fitting or applianct that till feles subconsideally and so stop the flaw of gas for the event that the finance is extinguished by any mosses. Among the objects to provide a simple and certain expedient wherey in twarter will be automatically clean wherey in the valve will be automatically clean wherey in the valve will be automatically clean of the control o

Mackines and Meehanieal Bevices
LABELING MACHINF A POLANGE
LABELING MACHINF A POLANGE
LAB INCOME THE METHOD TO THE INMACHINE AS THE MACHINE AS THE METHOD THE METHO

AN IRAID DEVICE-R FOGART, 10
Emmit 18t Newark N J The general objects
of the investion are to provide a means for attaching chains or equivalent elements to the wheel
so as to prevent stidding the attaching means
being in the form of an open spring rings that the



concentrically to and inwardly from the felly and which has overlapping ends with nuts so as to prevent the "ing from becoming automatically detached from the antiskid chains

We wish to call attention to the fact that w We wish to rail attention to the fact that we are in a position to render completes services in even iranch of patent or trade-mark work. Our said is composed of mechanical, alectrical and chemical experts throughly tended to the complete 
who needs in the pe MINN & CO. Patent Attorn

IN & CO. Patent Attorneys 233 Broadway New York, N Y

### An Airman's Story (Continued from mass 488)

(Constanced, row peer 488).

forty There was an average of a plane to a pilot Less than seven syndrog of a plane to a pilot Less than seven syndrog of a plane to a pilot Less than seven syndrog of the feat, and the syndrog of the feat, and the syndrog of the feat, and the syndrog of the feat o

clannish sort and tary up toppose the opponents. You get so you know that the other fellow has guts, too, because you find out, specially if you ever get 'wind up, what a lot of endurance it takes to stand

what is not of the strain.

'Well this German flyer was the right kind and he took his capture philosophiosily, and tho boys let him sort of loaf around until the guard came for him. One day some one had a bright idea and saked him if ht d like to fly an American plane The Boche thought he would Maybe he thought he could put something over! So they asked him, if they let him, would be give his parole not to try to get away Very properly he told 'em the German for 'nothing doing in the parole line' And that made em laugh and they told him to that made en laugh and they told him to that made en laugh and they told him to that in an a machine, and get away if he climit into a machine, and get away if he few rings 'round him had hereds him all over the atmosphere and finally made him fly down and land where he started from I run develtry and if G H Q ever heard about it, heaven only know what they would have done but no one told 'But the point I m making right here is this Show me the American airman or the British airman, captured by the Boches and allowed to get up in the sir, who wouldn't have eather got away or crashed trying, and I'll show you as airman who doesn't belong!

'The Spad sin't a bad machine, you know 'C and did not not not machine, you know 'C and did not not not machine, you know 'C and did not not not not make the contract of the contract o

know You can dive with your engine full on and stay together when you flatten out But the Fokker has fewer blind spots out But the Fokker has fewer blind spots than a Spad-much better visibility I'm not sure that an't why the mortainty was so heavy among the U S boys in the aff. The mortainty was 50 per cent at least for the war I know of one day-bombung squadron that lost 60 per cent of its mee in one day, and that's sure burning up airmen to make a German boliday. But don't let any one think I'm knock-

ing the best little nucleus of airmen in the world The Boche knew that, they didn't

in note as a sign the contract their nitrots in the world. The Boeche knew that, they didn't and of Food had only had parents or summer to evertous and the serious of the world. Our terminal parents or summer to evertous and the serious of the world of Food had only had parents or summer to evertous and the serious of the serious of the world of the serious of the world of the wo

The demand for electric starting and lighting systems necessitates the storage battery.

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### The Growth of Ellis Island (Continued from poor 427)

formed between adjacent blooks. These slots are then filled with bags of concrete to frm a k v that will look each blook to the next ne. On t p of these blocks a the next ne On t p of these blacks a concrete will se built faced with granite Horks the stone being anchored to the

n ret by means of cramp irons Ar unitedands No 2 and No 3 where de p water is not required the original this is being built a new inolded concrete in the lower left-hand corner of the title page illustration

### Supplying the British Farmer with the Sinews of War

(( nitinued from page 429) as possible to be made in this country and if was expected that over 60 would be available in time for the spring plowing In addition to the above supplies order borse drawn implements both for cultivation and harvesting and arrange-ments have been made not only to guard against a depletion of the existing supply of agricultural horses but to pur in ad litional 20 000 horses which with the increase I supply of plowinen, will be urgently required to carry out the in-

creased tillage program during the winter and spring mouths A different problem was presented in the case of fertilizers. The position in 1916 was briefly as follows. The supply of potash for which Britain has depended on The position in 1916 ows The supply of the rich deposits in Germany had been cut off. The usual quantity of sulfate of

ammount was available a large amount, but only small supplies of Chili nitrates had been forthcoming phosphatic manuns there was a considerable amount of base slag available from the steel works but additional grinding machinery was required in the case of superphosphiate the supply was limited by the munitions demands for sulfure acid

Fortunately it was found practicable to recover considerable supplies of potash from flux dust and a limited quantity was got in time for use with the 1918 crup while it is hoped to secure a greatly intra led aumonia owing to have reards suffer and aumonia owing to active propagands among farmers for an increased use of the fertilizer the consumption has arisen from 78 000 tons in 1916 to close on 180 000 tons in 1917 I xports have been prohibited so that as far as possible the whole output might be available for food production and munition individual in the United Angions In the case of phosphatic manures returns obtained in the spring of 1917 from the manufacturers showed that while some firms had supplies of acid they were short. of phosphate rock and the tersa Steps were accordingly taken to pool supplies with a view to more immediate produ

The provision of a proper supply of seeds and the control of prices have proved also matters of considerable importance In moure against the possible shortage of seed wheat for sowing in the antiums of suditions the bond Production Departminutees 2 000 quarters of seed wheat

tion through the War Agricultural Ex-excutive Committees was of great assustance t the allotments in a critical season. For 1918 steps were taken to provide 10,000 tons of tons of immune varieties for districts allected with wart disease to provide not less than 10 000 tons of non-immune varaties for small growers in other districts and to arrange for the planting with imand Ireland in order to furnish seed for and retained in order to turnish seed for infected areas in 1919. A vigorous cam-juigin was carried on by the Departments of Agriculture in all parts of the United Lingdom for the spraying of potatous against blight

Attention having been drawn to the mun factors in the agricultural program of 1917 the results as represented in the acreage and produce of crops may be briefly stated. Here however, it is necessarring and product of crops may be limitly stated. Here however, it is neces-sary to hear in mind that, while in the United Kingdom the tillage area for 1917 was increased altogether by nearly one was increased altogether by nearly one million acres, the evidence at the end of 1916 pointed to a fall in the area under crups in the 1917 season. Thus the effect crups in the 1917 season. Thus the effect of the campaign has to be judged not only by the actual increase realised but by the fact that a decline in the tillage area had been checked.

nea teen theeked Considered in groater detail, the returns of acreage of crops in the United Kingdom for 1917 show an increase of 50,000 acres in wheat of 140,000 acres in burley, of 616,000 acres in oats and of 220,000 acres of putations. The area under oats in 1917, 47(1),000 acres in the highest control of the property of the of the proper

4 761 000 aercson record in the United kingdom while the scrage under potatoes is the larges

It is estimated that the yield of wheat of burier by the same amount, and of oats by over 30 000 000 bushels to over 30 000 000 bushels. In potatoes where the season was exceedingly favorable for the crap despite the shortage of putash the yield is one of the highest on record the total crop exceeding that of 1916 by at least 3 000 000 tons, and the average er p of the preceding 10 years by 2 000,000 time. Altogether it may be said that the tiliage campaign resulted in the addition of not less than 600 into tons of cereal

find and 1500 000 tons of potatoes or agricultural land the shawing for 1918 is quite as favorable but shows of course no notable in-ercase over 1917. It was in the last-named ve ir that the machinery of war-time agricul time gut under full headway, and it this reason that we speak so much of 1917 ruber than later years. The outlook for the present and future is bright. Nothing has been more striking than the gene ra officiency and whole hearted loyalty of the throughout the country in carrying out thin novel and heavy duties and it is no exaggiration to say that these committee have succeeded in raising the whole stand art of farming and in creating a strong public opinion against the neglect or ing use of land which might be producing feed for the nation

### Weighing High Temperatures in an Electric Balance

(Continued from page 481)

same materials as the couple itself ment scored a testave of about 5,000 parties of wheat of the 1916 crop. The 11st has the great advantage of bringing parties of wheat of the 1916 crop. The 11st has the great advantage of bringing Departies of all the parties of th armers the ugh the Agricultural Lxocutive easily observed and compensated or kept c astant either manually or automatically the ability of the delicate and sensitive of heavy ropping varieties and of high purity for autumn sowing in 1017 During galvanameter to control the expenditure purity for autumn sowing in 1017. Durning this spring the gravest difficulty was one of a considerable amount of power has been countered in obtaining set spotatoes. The taken advantage of the potator tree in the distance of the potator crop in Sodian I and Iritiand from which seed reviewing and multiple-critical protators are that it claims and and the mean potators are clustly claims about to be reviewed an even of potators are built of the conference. The created arroage of potators about to be reduced arroage of potators about to be reduced arroage of potators are also much model to the mean front of the conference to continue the continue to the conference of the c

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(Continued from page 442)

is the most significant feature of the new

Another sutcreating application of the wtentiometer outht is in connection with the preliminary experimental work neces sary before heat treatment methods can be standardized. With all metals, there are standardized with all metals, there are certain well defined transformation points or critical points—temperatures at which oh mit if or physical changes take place The operations of hardening, working annealing and tempering must be carried out at temperatures hearing a definite re-lationship to the critical ones and it is accordingly necessary to determine the

latter with accuracy When a substance is heated to a trans-

formation point and allowed there to undergo the transformation the latent heit necessary to do the work of the formation point and allowed there to opposite the Susquehanas basin to the undergo the transformation the latent (unprowder River, a datance of about heat increasery to do the work of the fifteen miles. Barracks, officer quastrers without mirrasing the temporature of the total proving batteries are situated mean without mirrasing the temporature of the total proving the temporature of the sustained barracks, officer quastrers without mirrasing the temporature of the sustained proving of transformation is marked by Gunpowder Neck is occupied by the gas not considered to the sustained by the gas the sustained by ing drop in temperature. Now when we boil or solidify or melt or condense a substance we cannot watch it and state at what moment the transformation takes place things do not melt suddenly, after the fashion of an explosion. But if we know that the transformation is marked by constant temperature a temperature that remains fixed in spite of the absorption or evolution of considerable quantities of heat, we can use the recording pyrometer to locate the entical temperature with the greatest case and accuracy

In practice the sample under test and another body liaving no transformation another hody inving no transformation points within the rangi to be studied, are heated in close contact without another. This second body is termed the sample holder. It will become uniformly hotter holder. It will become unitoring notice (or colder) throughout the test while the sample will fail to do this when its trans-formation point is reached. Accordingly the difference in temperature between the two bodies normally zero or almost zero will take a sudden keep when the trans-formation point is reached

We must measure both the actual temperature of the sample and this temperature difference. The first of these obperture of the sample and this tem-perature difference. The first of these ob-servations is made by mount of a po-tention eter circuit in the regular way. The second is effected through a pyrometer Its second is effected through a pyrometer which his inseted of the more regular hot all cold junctions one junction in contact with this sample and one in contact with this holder. In this way it is construed to record not the difference between a known twed and an unknown versible temperature but rether the difference between two variable temperature. Temperatures are plotted as on coordinate the corresponding temcrature differences at another

(return differences at another bolds are assuped and sample holds assuped and sample holds are assuped and sample holds as the treath wafare range also are extracted house in the temperature difference. But such that the unperature of the sample remains statuonary or lags belind that of stated that the Allies asked us to concern the holds of the a transformation in the transformation in the grant on large realized-remount guins, and in sample the temperature difference underi.e. a change Illus change miny not be, in absolute figures, a large mar But the lift rent. was zero, or approximately 21 so any change whatever is bound to b on a percentage basis, a large one, mutually suited to boung well brought ut on the graphend record

ut on the graphical record.
Interesting features are frequently
brught out by the transformation point
records. Sometimes the transformation
I see not acrest the change in temperature
with twent, the retardation is apt not to be
uniform. Sometimes the transformation
during hasting and the reverse transformation during cooling—which are distinguished from one another by speaking
of det aloss one points and receiseeine
points respectively—affect the rate on

Weighing High Temperatures in an Electric Enlance in an example of the management of

### America's Great Effort in Ordnance

(Continued from page 423)

The Aberdeen Proving Ground consists of a tract of land about 35,000 sares in area, situated along the western shore of the upper arm of the Chesapeake Bay in Harford County Md It takes its name from the small town of Aberdeen, which is attuthe small town of Aberdeen, when is atta-ated about four inless west of the camp headquarters. The project was a war measure and it was completely planned and executed since April, 1917. It will be executed since April, 1911 It will be continued as a permanent experimental firing ground. The reservation extends along the Bay Shore as shown on the accompanying map from Swan Creek opposite the Susquehanna basin to the

The purchase of the land was approved by Congress early in October, 1917 The surveys were undertaken four days later and the first shot was fired on January 2d 1918 in the inidst of a violent snowstorm Since that time, construction work and firing proceeded in unison. Today there are quarters for some 8,000 men on the post and there have been invested in con-struction some \$10,000,000 Over 400,000 rounds of minor medium and major caliber ammunition have been fired. As a comparison with previous conditions before the war it is interesting to note that on a single day about 7,600 rounds were fired at Aberdeen—thore than were fired in the whole year of 1916 at Sandy Hook

### The Proof Rettories and Runnes

The majority of the proof ranges and hatterion are attuated adjoining the barracks for officers etc., near the northern end of the reservation. There are five parallel ranges each extending generally in a southwesterly direction and inclined at a slight angle with the Bay Shore. In that direction there is available a range on land of 1 miles and a clear range, over water of 1 miles and a clear range, over water of 1 miles and a clear range.

40 miles

The length of the main proof battery The length of the main proof battery is 2500 fct. and here are tested the following guins 37 mm guin 75 mm guin 18 mm guin 47-inch guin, 155 mm howiter 185-imin guin 5-inch guin, 6-inch guin 8-inch lowitter; 40-inch howitter; 40-mm howitter; 12-inch howitter 340-mm howitter; 12-inch howitter 340-mm for the star land range is 15 miles but range in pto 175 miles tan be obtained over water. The trench warfare range has a total length of 1 000 feet and the mortars tested there are the 3-meh Stokes 4-meh Stokes 6-meh Newton Stokes 240-mm trench mortars rifle grenades, and hand grenades

this direction we produced some exceed-ingly fine artillery, the test of which took place on a railway-mount range, which is made up of about ten tracks, so arranged that the guns on these tracks will have a clear range up to 75 miles. Fleetrie or gasoline locomotives are always on hand at this range to assist in placing the guns

In addition to the ranges above men-In addition to the ranges above mentioned there, what is called a water range The firing is done down the Chesapeake Bay and the fall of shots is over a shoal which extends approximately down the conter of the Bay and is, therefore, well clear of all shipping. The spisah of the shots as they fall into the water is recorded from 13 towers built on the western above of the Bay, in which observers are stationed. These observers that a reading the state of the Bay, in which observers are stationed.



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collected trangulated and the exact range obtained Means of communication beirdinary commercial telephone

I here are also three other ranges which ed for the testing of high explosive were used for the testing of high explosive shell. These are isolated, in order to protert the inhabitants of the Proving Ground from the extreme danger which is always present when high explosive is fired

In the late spring of 1918 the first In the late spring of 1918 the rist United States guns on railway mounts ame through in February to May, 1918 an improvised fixed gun carriage was constructed at Sandy Hock and from it the Sinch and 10-meh guns were range fired with new light-weight projectiles. In April the 14-inch naval gun was tested at Sandy Hook and shout the same time the first complete railway artillary unit the H-meh 50-collect naval gun, mounted on a rulway carriage, arrived at bandy Hook and proved a great success from its first appearance. The next gun to be tested on a railway mount was the 12-inch mortar and at this time all big gun testing was trusferred from Sandy Hook to Ab sleen and tried out at the water-range batters in a series of spur tracks initial complete 8-meh railway m initid complete 8-meh railway mount was f liewed shortly after by the first 16meh H witzers Other guns which arrived were the S meli railway guns, 7-mch nava guns and 12-meh morters on railway

### eral Bomb Testing

The Proof Department in charge of Major I. P. Lindh is divided into several actions to which some reference has already been made. Particularly interest-ing is the instrument set too which has there. I ill photographic work of velocity time and powder pressure measurements The cetion was housed in a perma-nent trick building, and it will be in a position to do excellent research work when the pressure of routine work decreases M at m should be made of the Aberdeen of a risk shift of made of the Aberaces, the nagraph an entirely new type much a re-maje at that the standard type which has bitherto been in practically converted use. This chronograph is the with a lieut Alger and it has given implet satisfaction in the work at

He development of high angle fire made study of the conditions of the upper atmosphere very important A detachment of the Meteorological Section, Signal Crps was sent to Aberdoen in March Measurements of wind and density aloft were in ide several times daily and the station grew to be the best of its kind in the United States It is now possible to obtain accurately the change in position of the point of fall of a projectile in both range and deflection, that would be caused by a wind aloft, however variable within five mnutes after a sounding balloon has been ol served to the height desired

The principal night activity at Aberdeen was that of testing anti-aircraft fuses visible at night tests were usually conanti-aircraft and over 40 000 other types of time fuses were tested at Aberdeen during 1918

I hen there was the Acceptance Section of the Proof Department which performed all the tests of manufacturers samples. It we divided into tests of powder and projectile cases, fuses, complete rounds, a d bombs. About two-thirds of the total testing in the United States was done at therdeen and so great was the pressure of this work that frequently tests w on twelve and fifteen hours a day This work alone involved the firing of about 200 000 rounds up to January 1st, 1919

### Testing Projection

Projectales were tested by firing them ader excess powder pressures to a chosen

America's Great Effort in Ordinance (Commune from page 144)
of every shot, and these readings are then solitected transgulated and the exact range obtained. Means of communication between Means of communication between the communication and the communication between the communication between the communication between the communication between the communication designs upon the communication between the communication of disgings upon the communication that communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in the communication is the communication in the communication in that are buried from three to mx feet deep in clay mud and water, lacks all the ele-ments of romance. On account of the percentage of large shells lost beyond recovery because they penetrated below the water level of the marshy soil, a concrete tank of large dimensions was built, into which the projection to be tested will be fired at close ranges. We had the pleasure of seeing a test of this tank and it promises to form a valuable feature of future Proving Ground work

I imitations of space prevent entering in any more detail into a description of the any more detail into a description of the enormous activities at Aberdeen, but we will dose by giving some particulars of the rounds fired since the organization of the establishment From January 1st, 1918, December 31st, 1918, a total number o 450 000 rounds was fired, the month of greatest activity was August in which 71 000 rounds were fired, the maximum week was August 10th to 17th, in which 21 000 rounds were fired, the maximum day was August 9th in which 7,700 rounds were fired

In conclusion we wish to express our indebtedness to (of William A Phillips, commanding officer at Aberdoen, and to Major I P Lindh, for courtesies extended during our visit to the Proving Ground

### Portable Rail Sawing Machines

(Continued from page 438)

larger size can be cut. These machines harger size can no cut inose machines have 18-inch diameter saw blades and special semi-high or high-speed steel blades are utilised, the high-speed blades being used for cutting high-carbon open-hearth saw is especially necessary when the and new rails installed in places. The worn or battered ends of old rails may be sawed off in track, instead of being trans-ported to shop or mill like life of many old rails is thereby greatly prolonged for service. After a cut has been made, it is only necessary to release the rail clamping device and throw the roller at the rear of the machine into position on the rail weight is then carried by the roller and machine will slide to the next position

max hine will slide to the next position.

There has been provided on the moderdrivers saw a friction device on the vertical
operate at a reduced speed when cutting
rails with hard spots and there has been
designed a compact, but efficient, saw
grinder for sharpening blades, which can
be attached to a break in the shop or on the
particular power plant. This grinder operaries in a speed of about 1,200 revolutions

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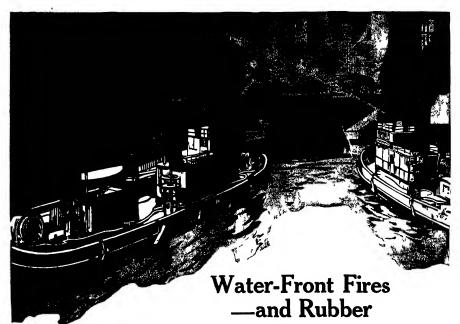
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### The Crystal Structure of Ice

THE X-ray study of the crystal structure of ice by a promunent scientist was rendered difficult by the fact that the rays tend to melt and to sublime the ice In a first attempt to turn the difficulty the and a next steempt to turn the dimonity has whole system was encased and cooled by see and sait, later a small ammonia machine was used which stopped the melting but not the sublimation of the ice, finally the crystals were encased in galeatin capsules in which they could be preserved for days. The isolation of a crystal also caused diffiin which they could be preserved for days. The isolation of a crystal also caused difficulties The prismatic commercial ice, unsuitable for examination, from a layer of ice 2 millimeters in thickness, produced of to 2 millimeters in thekkness, produced by pouring water into a pan, individual crystals could hardly be extracted, finally ice was frome out of a weak ast solution which yielded crystals with distinct cleav-ters are solved to the product of the country of hazagonal, as is generally seaumed, and could be referred to four inter-panetrashing triaggular paper listines, and to two assess meeting at an angle of 120 degrees, and a thirty casts vertical to the fewer.



A row of buildings on the water-front is ablaze Heavily stored ware houses are threatened A liner freighted with humin lives and costly cargo, is tied up at the pier

Complete destruction seems inevitable

But the fire-boat is coming! Soon a whole broadside of water—50 tons a minute—is tearing into the flames with an impact so powerful that walls tuinble and roofs are ripped away.

And what is back of this tremendous force

Rubber—that multiform material which has become so helpful an ally to man—a substance that has given him control over the most destructive of all elements—fire

The endless flood of water shooting into the flames, passes through fire hose that is lined with rubber

And the steam hose is rubber Rubber is in the packing of gates pumps pipe-lines and propeller stuffing box. It is used for the big suction and duscharge valves and for washers and gaskets of many kinds

Even in less conspicuous details, rubber is freely used. Insulation is made of it, so are the coats and boots of firemen. Floors, stairs and plat forms are covered with it. No matter where you turn you will find rubber in some one of its myriad forms.

And most of the rubber you see came from one or another of the 47 mills of the world's largest rubber manufacturer whose products bear the well-known U. S seal

Consult our engineering bureau regarding your rubber requirements. You can get in touch with it through any of our numerous branches



### **United States Rubber Company**



How did you feel last April?

"If the War would only end I'd give anything"

HOW often in the long long days of last winter did you say that to yourself? The shadow of war was on the land. The boys were going—perhaps your boys. You said. I d give anything and you meant it

Now the war is over Over because of the bravery of our boys Over because those boys were given the huge quantities of munitions necessary for victory

Now the price of Victory must be paid

The money from the Victory Liberty Loan is to pay for the shot shells guns ships and other supplies which made the warend sooner. Our Government spent money—huge quantities of money because it knew that you and I and every American preferred to spend money instead of lives. If it skimped on money more lives would have been lost—and the war might still be going on

This loan is a challenge to our honesty—a trial of our patriotism. Are we going back on our spoken and unspoken promise—I d give anything?

Ask yourself that and then subscribe to the very limit of your ability Ask yourself what it is worth to you to have peace and then increase your subscription accordingly



The Clean-up" Button Space contributed by

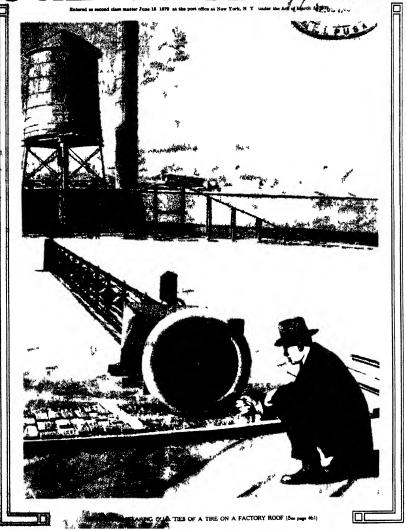
SCIENTIFIC AMERICAN

Prepared b American Association of Advertising Agencies scoperating with United States Treasury Desarrance





SCIENTIFIC AMERICAN



### THE WHITE HEAVY DUTY TRUCK

with

### DOUBLE REDUCTION GEAR DRIVE

Having all the leverage and flexibility of a chain and sprocket and the frictionless driving contact of gears which roll in oil, dust proof

### A New Low Cost of Heavy Haulage

The new White heavy duty trucks have been designed with but one end in view: to do more work at lower cost. They carry forward the White policy of building trucks to do the most work with the least effort.

For years the chain-driven White has set the pace in heavy haulage. It has held its own against a field of competition based on new axle features. It has won its place by sheer merit as a truck, and not because of any single feature in it. It is standard today in America's greatest fleets.

In White Trucks, mechanical changes are made only to improve operation. The company has always sold operating efficiency—truck performance.

The heavy duty models remained chain-driven until we were able to develop an enclosed form of drive having all the advantages of chain and sprocket. This has now been done. The Double Reduction Gear Drive is the full counterpart of chains in applying power. It has the chain pull, in gear form.

The new trucks follow a twofold aim in White design: sturdy engine up in front and maximum pull in the rear. The final drive saves power and therefore fuel. The lubrication saves oil. Light unsprung weight saves tires. Continuous operation saves time of both truck and driver by a steady volume of performance.

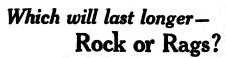
In all its years of transportation service, The White Company has never swerved from its original purpose to build an economical truck.

These new trucks are money savers.



THE WHITE COMPANY

CLEVELAND





You will say rock-of course-because it has withstood the destructive action of the elements for centuries Then why not insist on a roofing made from rock fibre instead of roofing made from rags or other organic materials

Asbestos is the only known mineral fibre from which roofing can be made It will permanently resist the destructive action of time and the elements and the ravages of fire

Asbestone is a Johns Manv lie Roofing made of Asbestos rock fibre which repels fire and resists the action of fumes acids and varying weather conditions. Being all mineral, it cannot rot, disintegrate or dry out Therefore painting is never required. Asbestone is a mineral fabric composed of imperishable Asbestos fibre waterproofed

with natural asphalts. It has a gray mottled Asbestic finish on one side smooth black surface on the other Can be laid either side to the weather Rolls contain all necessary steners for laying.

### Lowest Cost-per year Roofing

Lowest Cost-per year Roofing You do not buy roofing for a week or a month, or a year unless for some tempo a ry structure. You buy roofing to last as long as set to the second of the roof to the roo

### Register Your Roof With Us

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To the Trade - Our sales policy provides for the me keting of Asbestone through recognised distributors end dealers. Address nearest branch for particulars.

### Other Johns Manville Roofings

hns Manville Abbestor Roofings are made in great variety for roofing needs. Johns-Manville Abbestor and Colorblends nigits Johns-Manville Ready Abbestors Roofing Johns-Manville fift Up Abbestor Roofing for flat surfaces. Johns-Manville rugated Abbestor Roofing.

H W JOHNS-MANVILLE CO

RAGS

**JOHNS** MANVILLE **ASBESTOS ROOFING** 

### PACKARD TRUCKS AS GOOD-WILL BUILDERS

Establish Confidence in Delivery Safeguard Hauling Contracts

Lower Transportation Costs



NE of our most successful merchants says that before buying new fixtures or equipment he asks himself: "What will our

customers think about it?"

Nothing earns money on the customers' good opinion quicker than delivery equipment.

This is just as true of a coal yard as it is of a department store. As true for the hauling contractor as the local express company.

What people think of the Packard Truck is based upon how they have been served by it. Packard Trucks have served better because they were sold to serve.

If a merchant wanted just a truck he rarely got a Packard. If he wanted a truck transportation job done right, permanently and at the lowest cost—you were practically certain to see some Packards running around with his sign on them.

And so the public have come to believe that Packard and good service go together.

r r e

Naturally, some business men will praise the idea of buying trucks on a transportation basis but will try to beat the Packard method. It cannot be done.

Nobody has a patent on the plan, but trying to carry it out with the ordinary motor truck, only serves to show up the truck.

To make it work—to make your truck transportation costs a definite, predeterminate figure, low enough to meet all competition—you must take equally good engineering design, equal stamina, equal long life with the Packard Truck.

Everybody knows the Packard reputation. You've heard about the many Packard Trucks now running that have travelled more than one hundred thousand miles.

Which will a business man do? Pay \$3,000 for 50,000 miles—or pay \$4,000 for 100,000?

Investan extra thousand dollars to insure minimum transportation cost—or pay out that thousand in repair bills that were not in his original estimate?

Anybody can recite the theory of cutting down transportation costs. The Packard Freight Transportation Department can give actual facts and figures. Their services are available to any business man—by telephone, mail, or at the local Packard showroom.

"Ask the Man Who Owns One"

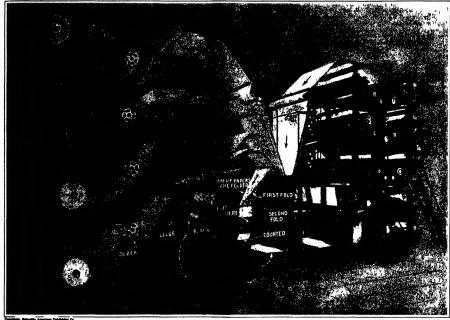
PACKARD MOTOR CAR COMPANY, Detroit

# SCIENTIFIC AMERICAN

### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX. NEW YORK, MAY 8, 1919

10 CENTS A COPY



A double octupie and color combination press partly broken away to show the course of the paper webs

### Our Largest Newspaper Presses

A VISITOR to the press room of one of our large modern newspapers usually gases with uncomprehending amasement at the huge and complex machinery. He sees the big rolls of paper melt into ewfitly flowing streams which mysteriously take on ink in their ourse and end up in neatly folded newspapers counted and ready for delivery

Our artist has ome to the aid of the mystified observer and draw one of these grantic newspaper presses with a part of the framework and mechanism broken away so that its gossible to follow the course of the paper through the paper. This illustrated the machine losses much of the oscillation of the societation of th

Let us fallow the course of the upper wil in the left hand set in Immediately to the right of the paper r I as the sub-trough in which there is a cup sait in right in that pick up the ink in a time lift. In a sub-triangle is periodically touch the roller in the trash and Irande a small amount of it ke a secree of relieve which when longitudinally and pred the ink unifurally over a large follow. That in turn transfers the ink to a proof form rollers which finall deliver the ink to the practing automatic and the sub-transfer and the properties of the sub-transfer and the properties of the sub-transfer and transfer and the sub-transfer and the sub-transfer and the sub-transfer and the sub-transfer and transfer and the sub-transfer and th

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against a scoond plate cylinder or that the reverse ade
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and all shown in the drawing. He paper well then proceeds to the folder. In the sum way all the other weeks are printed. Fail put the large of the l

I ach section is privided with two folders. Our artist has shown the webs as if it y were hilf of the ordinary withit and has illustrated only one of the folding mechanisms. Actually the paper is slit by a rivolving kinfe blade so that the paper as slit by a rivolving

(Continued on page 467)

### SCIENTIFIC AMERICAN

Published by Scientific American Publishing Co Founded 1845

### New York, Saturday, May 3, 1919

Munn & Co 233 Broadway New York

Charles Alle M Tres le 1 Ors D Minn Pressurer
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are published elartice
The fidst is glit line submitted to him timely irts les suitalli f lies lumis especially when such articles are or mpinilly ph t griple

I do not know whether we favor a loague of Nutions or not of Nutions or not we are not sure what sort of a League we would have if we could But we are entirely clear that in the organicuts against the League there is to be found a vast amount of sheer HONSONS

A favorite plea against the Langue so far as the United States is concerned is that it is unconstitutional The right to make war and peace resides under our Constitution, with the Congress If we enter a League of Nations we agree not to make war and the Congress loses its constitutional rights in the premises Or, perhaps the constitutional aspect is not emphasized perhaps we are solemnly told that we as a nation must not give up our (cod-given privilege of making war when and upon whom we please

Very good But what is the difference between treaty with one nation and a treaty with a score of nations? Peace can be made only by a treaty, in any event and our treaties we hope, are binding So the moment we make a treaty of peace we are bound not to make war, except in defence of the terms of the treaty Then, whether we put the matter upon the basis of constitutionality or upon the basis of our own inherent right to make war when we want to, peace is objectionable

If you can make a prace treaty with one nation you can make one with a dozen You can make one with the world If you can t make a peace treaty on a large you can't make one on a small scale There is no middle ground either peace is unconstitutional, or it isn t Ho says a correspondent of the New York Times and we must agree with him

to our humble intellect it seems just as reasonable to object to law and order on the ground that it prevents us from assaulting our is xt-door neighbor when the spirit moves us that it forces us to settle our grievances with him through a legal procedure which imperils our rights as it is to object to a I eague of Nati ns on a similar ground

We be always supposed that the prime object of a League of Nations was to prevent war. It seems a trifle curious to have it violently objected to because it threatens to accomplish just that purpose

### What the Weather Man Thinks of Ocean Flying

THERF has of course been v luminous discussion of the trins Atlanta flight but with few exceptions this is centered around the me hanical festures my lyed. Now this is altogether necessary and proper but t has the mechanical side of the crean flight has been devel ped to precisely the point when naderation of an ther ospect of the case is in order

It is no longer problematical whether a plane can to built for which a flight of tions Atlantic distance is a phy i d p subdity this questi it is conceded to have been answered athrmatively. On the other hand while we may yell ope for the day when any plane of adequate are that a fact take the air at all may be pointed for the other sale of the wirld with assurance of getting there, we are still a long way from this consummation

If, then an arrplane today can make the crossing, while a green air plane will probably fail the determining factor between success and failure is external conditions

in the case of the airplane external conditions means the weather True, weather conditions have been mentioned freely in connection with the efforts now being made to win that \$50 000 but they have been mentioned in a wholly insufficient way If the weather on its face is bad the aviator will keep out of the air if the weather looks as though it might be favorable he will start and trust to a benevolent Providence to see him safely across This does not constitute adequate discussion of a determining fact ir

Weather is a complex of temperature humidity pressure wind direction and velocity precipitation. On all these heads there is much to be said with regard to the diff rance between conditions at the surface and above it letween conditions over land and over water. There is much to be said much even to be learned with regard to average and extreme values under each head mentioned with regard to seasonal and local and casual variations with regard to protable values at a given time and place with regard to the effect of each of these factors upon the functioning of plant and pilot There are special ramifications to be discussed with regard to fog its altitude duration and extent and with regard to other items of equally special n ture

A compilete n of what we know and what we hope to and out under each of these heads is essential to flight across the ocean on any basis other than that of a sporting proposition with death Accordingly the United States Wenther Bureau has assigned on fits meteorologists to investigate the subject and am ug his duties is that of being present at the starting p int of trans-Atlantic flight to advise the aviators upon weather conditions Lurther than this he has prepared a statement showing just what bearing the meteorelosical conditions known and suspected to exist along the probable routes of flight may have upon the success of the venture. This statement considers the various questions which we have suggested and disposes of them se far as it is possible to do so On the whole, it is a real contribution to the literature of the subject, and we have decided to print it in the Suill EMPNY as such The tirst installment will appear under the above title in the current issue, and it will be completed next week. It will be found that Mr Gregg has information and suggestions of extreme value to the ocean flyer

### Jellicoe at Jutland

NIFREST in Admiral Jellicoe s story of the Grand Fleet culminates of course in the Battle of Jutland the account of which is given in the same simple and straightforward fashion that characterizes his whole book It is evident the Admiral feels that he has nothing to conceal nothing that calls for apology He makes the frank admission that in many respects the German fleet though less numerous was ship for ship, superior to his own being more heavily armored with better under-water protection possessing better rangefinders better searchlights, a more numerous destroyer fleet (88 destroyers to his own 80) and that it was more completely provided with torpedoes the German destroyers carrying mx torpedoes to the British four and their battleships carrying from five to six submerged turpe do tubes as against from two to four tubes in his own ships Although Jellicoe had 27 battleships in line against the German 17, the Cormans possessed five destrayers per ship, the British only three per ship

We give these details because it is very evident that it os the formidable nature of modern torpedo attack that controlled Admiral Jellicoe's tactics both in his deployment on getting within range of the enemy battleship fleet and also in his disposition of the Grand I hat for the night, after the German fleet turned away to the west under cover of a protecting smoke screen raised by its destroyer flotillas

As every one knows, a violent controversy has arisen m ( reat Britain over these very tactics of Admiral Jellicor He is accused of having fought with overcaution Comparison is made with the dashing attacks which carried Nelson to victory But, as Jellicoe very pustly states there is no parallel to be drawn between Traisigar and Jutland The High Sea Fleet repres everything in the way of first-line ships that Great Everytung in the way of mit-ine amps that Great
In view of the lact that there was no reserve of dreadmought reserves, whereas 'in addition to Nelson's superiority, algoridge the schole Allsed cause, we believe
force of 26 capital ships and 19 frigulas, the navy in
1805 had momission in home waters and the Angelles where the schole and the reserves in the schole and the schole

and 50 frigates" Furthermore, when Trafalgar was fought, an additional 32 ships-of-the-line were building in England and 10 in Russia, whereas only five capital ships were under construction in England when Jutland was fought

When Jelkeon obtained definite information of the position of the German fleet, he was coming down from position of the German need, he was coming down from the north-east with his battleships disposed in six parallel columns with a distance of about one mile between columns. The German battleships, in line of battle (single column) were coming up from the south When first sighted the liesd of the German line bore about southeast from the head of the starboard or right column of the British fleet, distance about 13,000 yards It was now necessary for Jelheos to deploy, t s, form his fleet into one long line of battle. This is done by the leading ship of each column turning say 90 degrees to port or starboard the slups of each column following its If Jellicoe deployed to the starboard, it would bring his flast on a converging line and therefore nearer to the German destroyers, if he deployed to port his fleet would turn somewhat away, and the range would be lengthened For what seem to us to be sound tactical reasons he deployed to port-and for this he has been most savagely entirised

But let the Admiral speak for himself "My first and natural impulse was to form on the starboard wing column, in order to bring the ficet into action at the earliest possible moment but the sound of gunfire, the German fleet was not yet visible through the must, showed that the High Ses Fleet was in such close as to create obvious desadvantages in proximity such a movement I assumed that the German destroyers would be shead of their Battle Fleet, and .
it would be suitidal to place my Battle Fleet in a pos-

tion where it would be open to attack by destroyer during such a deployment, as such an event would throw the fleet into confusion at a critical moment In this connection it should be noted that 20 torpedoes passed through a single division of his battleships and were avoided only by quick changes of course

Further considerations were that the starboard divisions, nearest the enemy, were composed of the earlier ships, "with only indifferent protection as compared with the German capital ships," and since it would take 20 minutes to complete the formation of the line of battle' and the starboard divisions would have to execute a large turn under the concentrated fire of the best German ships at a range of 13,000 yards and less, Juliance deployed to port

Thereafter, with Beatty and his battle-cruisers leading the line, the great battle between the 55 capital ship was on The German tactios consisted of repeated destroyer attacks, followed by emission by them of smoke-screens, under cover of which the Germans or tinually turned away, especially when they came under heavy gun-file This continual turning of the German fleet to the starboard caused the action to take place in two roughly concentric curves, with the Germans on the inner and smaller circle, so that in this intermittent daylight action, which was interrupted frequently by the thick hase, the German fleet actually turned 18 points from southeast by east to west. When night hidden by the smoke-screen of its destroyers

Then followed the night action, for which also Jellieo has been bitterly criticized—and also warmly defended His critics claim that in view of his superiority in battleships he should have dashed in that night and fought lee action (for such, in the confusion of the night, it would have been) and sunk the whole German fle But Admiral Jellicoe thought otherwise Save he "The result of night actions between heavy ships must always be very largely a matter of chance Such an action must be fought at very close range, the decision depending on the course of events in the first few minutes The greater efficiency of the German searchlights and the greater number of torpedo tubes fitted in enemy ships. combined with his superiority in destroyers, would, I knew, give the Germans the opportunity of secring heavily at the commencement of such an action "

In view of the fact that there was no reserve of dread

### Engineering

Dock Gates of Reinforced Concrete.-Owing to the scarcity of timber and steel during the war, the gates for a private dry dock in England were made of rem-The dock is 40 feet wide and the gates They are circular in form and de are 14 feet deep the 14-foot head of water are only 31/2 inches thick No waterproofing compound was employed and yet they are said to be perfectly water-tight

Spray-Painting Corrugated Steel - The corrugated steel used for airplane hangars in this country and oversome was painted before shipment. Owing to the large quantity of steel, it was out of the question to do this work by hand and machines could not be used on account of the corrugations For this reason, a spray system of painting was employed First, the sheets were coated with red lead before being corrugated, and after that they received a coating of green on one side and gray on the nther side, applied by means of a jet 14 inches wide

Wooden Lath Natting - A povel material for house building has been developed in Norway A netting is employed, made of wooden laths 1ht laths are two meters long and eight millimeters square in section in roughly about fiths of an inch square. They are bound in a lattice form by means of tinned iron wire and applied to the wooden framing of the building. The netting is plastered with a mixture of sand lime and plaster of paris, or cement, sand and lime A number of buildings have been put up in this way and have proved very serviceable, even in severe winter weather

Oil vs Coal for Warships In a paper recently read before the Burlington Association of Mechanical Engineers, the advantages of oil fuel over coal for warshing were minmarized as follows | lor an equal bunker weight the radius of action is increased 50 per cent, and for an equal bunker space 50 per cent. Oil furnishes up to 83 per cent of thermal efficiency as against 50 per cent for coal Smoke can be controlled perfectly when it is desirable a donse amoke screen can be produced or the smoke can be entirely climinated With oil fuel, the boilers can be forced up to 50 per cent above their normal rating Oil fuel reduces the amount of labor by about 70 per cent There are constructional advantages in its use and ships can be bunkered at sea much more readily

Rolling Boilers 21 Miles -Over a year and a half ago, the passenger steamer 'Bear was wrecked along the coast of northern California and six 45-ton boilers worn salvaged from the wreck. It was planned to tow these boilers to Eureka, (al but after a number of attempts to do this had failed it was decided to roll the hollers along the heach for a distance of 21 nules to Humboldt Bay Lach boiler weighed 45 tons and was 12 feet in length and 13 8 feet in diameter. The work involved clearing a road along the rocky beach. In two places rivers had to be crossed At the Bear River crossing, the builers were rolled through a ford while at the Cel River crossing they were loaded on a barge and towed for two miles to a point where the rolling process could be continued. When the boilers reached Humboldt Bay, they were loaded on a barge and towed to the wharf in I ureka

Bearing Power of Piles in Clay Soil -A recent usue of the London Engineer quotes the following from a lecture given before the Society of Engineers Clay, containing a definite percentage of water, and at a definite temperature, has a definite pressure of fluidity. and when this pressure is reached and maintained, the clay yields indefinitely as a dense viscous fluid, unless it be restrained from flowing or caused to rise so as to produce a statual head of clay 1 or equal depths, tapered piles support a larger load per unit volume of the pile than piles having parallel sides, the reason being that as their surfaces keep in more intimate contact with the clay, the friction on their sides is greater For a given quantity of material of which to make piles a larger number of small piles as more efficient than a smaller number of larger ones Pointed piles are more efficient per unit volume than blunt ones, because the points cause a more gradual lateral displacement of the clay, thus leaving it in more intimate contact with the clay, these leaving it in more intimate contact what can add the piles. The residence of the piles The residence to penetration is of vora less immusises the general population to such considerably greater the lower the temperature of the an extent that the epidemic declines spontaneously, elsy, probably because the pressure of finite the spontaneously, the exhaustion or thinning out of infectable

Training Field Workers in Eugenics -- Director C B Davenport of the Eugenics Record Office on Long Island, assisted by Dr. H. O. Laughlin, has been giving every summer since 1910 a six-week training course for field workers in ougenics. The course comprises 25 lectures on human heredity and eugenics with special reference to conduct together with laboratory work on charting family pedigrees, tracing the descent and recombination of human traits in pedigrees statistical studies on variation in plants and animals studies in the elements of biometry, etc. ( linical studies are made at institutions for various types of the socially inadequate and field trips are made for the purpose of securing family pedigree records at first hand

Charles Brinkerhoff Richards, scientist and inventor and connected in a professorial capacity with the Department of Mechanical Engineering at Yak for the past 14 years died at New Haven on April 20th Professor Richards who was in his ciglity sixth year, was one of the last of the old school of technologists who were forced, in the absence of engineering or technical schools to hridge by their own efforts the gap between the theoretical subjects then offered at the colleges and the practical arts in which applications of these studies lies and that no such obstacle as this will keep a great engineer down was amply demonstruted in his case as in many others. Aside from his long connection with Yale Professor Richards was, perhaps best known as the inventor of the steam-engine indicator that hears his name and that has been termed the most important single factor in the development of the steam engine since the original inventions of Witt pioneer in the development of the platform walt ma chine for testing the strength of materials and was responsible for many advances in the field of heating and ventilation

Sex a Relative Condition - The claborate investigations of sex phenomens in various plants and annuals made by Dr A M Banta, under the ampices of the Carnegie Institution (Department of Experimental Evolution) lead that biologist to some interesting ideas which he sets down in a recent report of his department

We are roming he says "to the time when it would sem imperative to revise our ideas of the fixity of sex With the relativity of sex so emphatially shown in hybrid pigeous in hybrid moths, and in different species of Cladocera one wonders if the relativity of sex ends with pigeons gypey moths and witch flear There scoms every reason to think that it does it the phenomena of the crowing hen and the sitting the masculare woman and the efformate man as merely conspicuous examples of sex intergrades which refute the common conception of maleness and female ness as complete, opposed and mutually exclusive Indeed it is a reasonable supposition that is always relative—that while most sexual individuals of whatever species are prevailingly male or prevailingly female every individual may have something of the other sex interningled with the provailing sexual characters

Some Facts About Infantile Paralysis -- \ voluminous work setting forth the results of studies on poliomyclitis (infantile paralysis) in New York ( ity and the northeastern states during the year 1916 by Drs Lavinder Freeman and Frost, has been issued in Washington as Public Health Bulletin No. 91 The tentative conclusions reached by the authors are as fellows 1 Pohomyelitis is in nature, exclusively a human infection transmitted from person to person without the necessary intervention of a lower animal or insect host precise mechanism f transmission and ivenues of in fection being undetermined 2 Infection is far more prevalent than is ex dent from the merdence of charcally cognized cases, since a large majority of the persons infected become 'carriers' without clinical manifesta-It is probable that during an epidemic a very considerable proportion of the population become in-fected, adults as will as children 3 the unrecognised carriers and perhaps mild abortive cases are the most important agencies in disseminating infection 4 An demie of one to three recognized cases per thousand,

### Automobile

Combined Horn and I amp - I wo prominent men in the Lastern automobile trade have invented a combined horn and headlight for automobiles that is said to save material give adequate protection to the horn and at the same time provides for mounting the horn at a point where it is most effective or at the front of the our The construction worked out by the myentors is as follows. Near the roar of a haddlight. ( the usual bullet type and below the horizontal diameter of the lamp a hole is made, and the metal edges are turned up and This opening is slanted both downward and rearward to prevent rain beating in or the careless flooding of the lamp by the car washer. The ferrule is provided as the supporting member of the signaling device, as well as the mouth of the horn, as this is the aperture through which the warning sound finds egress mechanism of the signalling device may be any of the types now to common use. It is either made integral with or connected to the ferrule and fits snugly in the rear of the lamp in the space back of the reflector the vibrator type of harn, the hanne are not altered except for the making of the one hale the bulb arrangement is not disturbed and the wires of the horn are threaded through the tubular member of the lamp and its regular supporting post with the lighting leads. No other wires are required

Wick Oiling for Chassis Parts -For some time past automobile designers have sought to provide some simple form of automatic lubrication system for the usually neglected parts of the car chassis such as the spring bolts brake connections radius rad bolts spring shackles and other out of the way parts While oil is not an ideal labricant for heavily loaded slow moving bearing surfaces it has the advantage over grosse of being fed by capillary attraction while greas needs pressure to force it to the hearings and if this pressur is not appiled, the grease will not flow. The method employed is to cast or otherwise form oil reservoirs integral with the supporting bearings and to have a wick run from the oil through the hollow bolt in shaft that is to be Jubicoited The wick draws up oil constantly which is supplied the bearings by suital is drilled boles in bolt or shaft ally such a device is ant most; in action and as the reser voir may hold enough for several weeks operation the motorist is not called upon to give the oiling means frequent attention and the essential lubricating process is not apt to be neglected. As the parts thus oiled automatically are these that we ir out and make noise when the ear is operated any system that insures a regular supply of oil and consequent diminution of depreciation is worth while. It is believed that many of the new mod is will have some such automatic orling means for

Simple Gage for Measuring Compressions -- One if the most common causes of lost power in an automobile is that the force of the explosion pressure depends upon compression pressure before the gas is ignited. If the compression is 80 pounds the explosive force acting against the piston top and imparting power to it will be about 400 pounds per square inch. If worn piston rings or leaky valves allow gas to escape when the piston is rising on its compression stroke, the resulting decrease to 50 or 60 pounds means a reduction of explicate pressure to about 300 pounds per square such. Besides this diminution in pressure there is a loss due to further leakage t'irough the faulty retaining members \ \simple compression pressure indicating gage may be made by taking an old spark plug body from which the percelain has been removed and fit in a valve from a discorded onner tube by pouring melted babbit metal r solder in to fill the space between the spark plug shell and the valve When the metal has set the valve is found to be firmly imbedded in the soft metal. The spark plug is removed from the cylinder to be tested and the combination plug body and valve stop put in its place. As the country is turned over briskly by either the hand-crank or selfstarter by an assistant or the orgine run slowly on the other cylinders is tire pressure re ording gage held against the valve will record the compression pressure just as it does air pressure inside a fire If the pressure is low on all cylinders it is a good indication that the entire engine needs attention. You can determine whether the compression is adequate by comparison with

### America's Optical Emancipation

How a Dreamer of 66 Years' Standing Has Seen His Vision Realized

By Hugh A Smith

I a steep river road from the flats below trundles a U is steep river road from the nate below tundles as lead of carst loud large but in the industrial his cloth of carst loud large but in the industrial his cloth fact ive on the trials if the age-we re give it has supplianted the ocean liner and irrussilloute frighter turthering it furnals each it with a fitte solution. Turnierum et turnstes dati viin. I the solution of the mast dibent ent ent ent int in Morriean urgent warting ut dustress. I a the tricl is Luken with opti al gloss can ug the mest practice and bitherto muttamable of rise mut risks. When the problem of its manufacture was a catally a leed for the first

of its manifecture we set of tills a leed for the first time in More; a the chiminating chapter was settlen in the outsigned in the pit of industry from Germany tuttal a letter in recting to involve say optional glass. At he divise reducibly from ware variety we regard to some of the exclusive in histinal bertrages of a very few large nor contrast particularly for exclusive industrial hiritages of a very few fur pean countries particularly ter-many it was as of those industries shruded ir involvey whose secrets are handed of win from father to son in rehanked discussions lather to some re-stricted communities. Then the wared adds by ke in large and of a sudden ships could de king it. American parts with their cargoss of the foreign product. American ingeninty faced another of those raw material problems which must be solved if one of the country's most im-portant industries was to be maintained saved it one of the country's most rap-portant industries was t be maintained it was a crass in that industry which the government was quick to recognize and keenly so when America entered the way for without optical glass it could not obtun the range finders gun sights periscopes searchight mirrors photographic lones binoculars and other optical instruments, which it immediately called for and with out those instruments America's army and navy would have been but blinded forces in the practices of modern warfare

tores in the practices of montri warrare.

This condition is not one of recent growth When John J Bausch came to Rochester N Y in 1853 and by hanging a few pairs of house-made glasses or spectacles in the small front window of a cubbler's shop,

spet tactors in the small front window of a cumier's scope, founded what has grown into a great optical business he was compelled to make his spectacles with lines a imported from the old country. Optics was at that time imported from the old country. Optics was at that time almost an unknown science in America and its industrial application even more rare. Popular projudices decreate that everything optical must come out of Lurope Nevertheless the lenses which Furope delivered to young Bausch were se unsatisfactory to that exacting mechanic that he constructed the first lens granding machine in America and lugan to grind his own by hand one specimens of his superior product attracted the attention of New York opticians who straightway dis

covered the source and be supplied with any sur plus lenses which he might turn out As sons grow up and joined their father, the acope of the business was gradually various fields of higher optics contending at every step of the way against preterence Furois in products Ioday every type of optical instrument is proplant, which undoubtedly, an c the outbreak of the war, has come to be the largest optical manufactory in the world, not even excepting the wonderful establishments fostered and subsidised in the past by the German government

government
During all that development however this pioned establishment was compelled to depend upon Europe for its basic raw maternal, the opin all glass constituting its his blood. This condition disstantial its founder as much as had bis earlier deposit new upon Germany for voglass lenses. The matern it was satisfactory enough but the source was too remote, and the relationatip out of harmony with his other plans and purposes.

The special pottery where pets are made that will satisfy the exacting demands of ontical rises manufacture

In the development of his business Mr Bausch had ained to control all processes insofar as possible, having his own foundry, in which were cust metal parts for the has own foundry, in which were cust metal parts for the different instruments, and his arapenter and cabinet shops, in which all wooden parts and cases were produced in the plant, but all from the rough glass blanks origina-ting in Lurope Thus condition was so galling that often in the presence of his son, William he declared that he would give all ht possessed if he wer not compiled to look to Furope for this glass supply. Such statements influenced William Bassel is a early as 1903, to begin some secret experimenting on his own initiative in the

httle glass-pressing plant which had been erected in the preceding was on the Genesee River state behind the recording was on the Genesee River state behind the recording the first between the purpose of moding the behind the before grinding. His first attempt, its one of the small and wholly indequate pressing furnishess, proved most inauxplesous. Seeking a pure, white glass, he obtained. The sax of the job he was attacking may be inferred from a hund reference to the hattory of opioid glass from a hund reference to the hattory of opioid glass from a hund reference to the hattory of opioid glass of the world's formants optical securities, etaled that the future improvement of the microcope was an the hands of the glassmaker, implying that the optician had gone for the glassmaker, implying that the optician had gone after a he could in the development of precision optics with the glass then available in response to this appeal DF efloit, and had the control of the country of the co

This Jens glass, so-called, is marked by its absolutely clear transmission power and its freedom from all strain and strass, groung it an entirely even refractive index throughout. It is capable of heing cor-rected for both chromatic and spherocal aberration, which means that it can be made to transit perfectly accurate and colorless images to the eye, the photographic plate or the screen, as the case may be It is absolutely essential to the manufacture of optical prisms and achromanufacture of optical praises and accur-matic kines So exacting and difficult are its requirements that any pot which yields 20 per cent of usable glass after final inappection is considered very satisfactory. This results of come, in a high manu-facturing cost the list price of optical glass of the quality indicated ranging ever before wartime advances, from \$1 to nearly

Mr Bausch's early efforts to accomplish Arr Dausen's earry enters to accompuse a has purpose of producing this glass in America appeared so futtle that he practically abandoned the project for a number of years. Finally, in the apring of 1912 he attacked the matter by again entrasting his purchasing agent with the task of obtaining information. regarding equipment needed for optical glass manu-facture in Rochester At the same time he advertised facture in Rochester. At the same time he advertised in the trade papers for a glasmaker, in the vain hope that a lone member of that its, with optical glass experience, might have strayed to these shores. He was unable to find such a definitely transed arisan, but failly locate a young Beignan, Victor Martin, a glass-cutter by trade, whose father had been a glassmaker in Beignan Wilson Bauch ungged at his Beignam Than Beignan Wilson Bauch ungged at his

personal expense and at work on the river flats He also put an oilfiring furnace in a small shed

adjoining the pressing plant. With that equipment Martin began his expe early efforts more successful than had been ployer, and most of the year 1915 he spent in study-ing what works he could had on the subject



A pot of optical gians (right) after cooling for several days; note the clay cylinder pot. At the left is shown the same pot in assessment.

In the spring of 1914 he designed and built another oil-firing furnace but was unable to hold the required temperature with it The city gas as then applied, proved to be an equally unsatisfactory source of heat, and efforts were practically suspended until after the war started in Europe in the late summer of that year Then the importation of glass speedily became difficult nd uncertain All of this most important maternal that the company could count on for its future operations was the surplus stock which

the surplus steeds where it is chanced to have in its vaults at the time

The other members of the company accordingly same definitely interested in the problem, and in the winter of 1914-15 a second building was erected on the river flats, containing two gas-firing furnaces and one potarch, or smaller furnace, which is used for the preliminary beating of the pots The work could now be undertaken

heating of the pots. The work could now he on a larger and much more effective scale for, with the knowledge of theory and formulae already acquired, successful pro-duction was largely a matter of persistent experiment and repeated effort. The first melt of barium crown glass in May, 191) came out purple and was not usable. In the third melt of the same month however some light crown and dense fint glass were produced, which were usable. During the following month light fint was also successfully produced and experiments were begun on most of the other types in more common use

common use
Thus after three years of labor, more
disheartening than can be indicated here
following several other years of dreams the
victory had been won and another Furopean victory and need won and another Furopean monopoly, an exceptionally tenacious one, had been broken No boastful announcements were made however, as the pioneer producers wished to be absolutely sure of their ground before taking the public into their confidence In the early summer of 1916 specimens of several different types of optical glass were displayed at the national conventions of the American Medical Association and the American Optical Association in order to allay the somewhat panicky fears of the trade profession at large

the winter of 1916-17 the plant produced glass which was used in the manufacture of several hundred high-priced anastigmat photographic lenses, hitherto employing only the highest grade Jona glass Those employing only the highest grade vone gass. These lenses were fitted to speed cameras and subjected to the most exacting tests. In subsequently congratulating the plant on its achieve-

ment the camers manu facturer wrote "Our critical tests of these lenses show them to be not only equal, but superior to the same type of lenses hereto-fore made from imfore made from ported glass "

ported glass"
When America en-tered the war in April, 1917, one of the first objects of the govern-ment's concern was the supply of optical glass. The authorities made a survey of the attention and found that of the ral establishments at that time contending with the problem, the plant which William Bausch had fathered in



Taking a pot of glass from the furnace. The pot is really almost white hot, but looks dark in the glars from the furnace, whose temperature is about 2500 degrees Fahrenheit

the Camegic Institution, at Washington D ( which had been turned over to the givernment at the outbreak of the war accordingly established a research laboratory at the Rochester factory, at the suggestion of the Council of National Defense. The Complexical Laboratory was headed at that time by Arthur I Day, Ph D who de

Three of the many pressing furnaces in which the small pieces of finished glass are fashioned into approximate form

tailed Major I E Wright, Ph D at that time a civilina, to take charge of work at Rochester
The government laboratory came to Rochester in the spring of 1917 with a staff of six mn — I he chief difficulty up to that time had been in the low transmission power of the glass produced. The government workers were

instrumental in obtain ing purer raw materials which this difficulty was largely covercome and it then became simply a case of trying out different methods of stirring and temperature luce glass of the highest quality

Meanwhile the glass plant was materially en rged by the erection of additional plant and buildings until today it is one of the largest optical glass plants in the world It employs when running full force about 500 hands and contains besides ax single pot arches eigh teen double-pot arches ind one stone arch tive

single-pot melting furnaces three double-pot melting furnaces and one 16-pot melting furnace with a total capacity of about 116 pots a month. When the plant is operating at full capacity, it consumes more than 33,000,000 feet of gas per month or an amount equal to the total monthly consumption of a city of 60,000 inhabitants

Of the different types of optical glass hight crown bore sheate crown barum crown light flint dense flint and silicate cr wn (the last named for ophthalmic are being prished of a quality lemas are being praduced of a quality equal temp previous obtimed from Europe while experiments on other types are constantly being indicated. He ex-tent to which the praduction has been placed on a practical and permanent basis is indicated by the fact that when the arimstice was signed enough finaled American glass had been placed in the vaults to list the company several years under normal operating conditions

I arly in the development of this activity difficulty was experienced in obtaining suitable clay pots for melting the glass at the tremendous temperature required American potteries had never before been called upon to meet such exacting require ments. In using the best pots obtainable ingredients from the pot would too often ingredients from the pot would too often mingle with the incitru mass and spoil the resulting product—this difficulty was finally overcome by building a pottery alongside the glass plant engaging a technically trained expert in teramics and making on the spot pots especially de-signed for their specific uses seens of optical glass manufacture are fas

consting and more or less spectacular. The pot a heavy, consting and more or tess spectual unstaining of a neary, oylindrical vessel of superior class open at the top and measuring from 25 to 36 inches in diameter according to the requirement is brought from the storeroom of the pot house and placed in the pot-arch for preliminary

heating which takes four or five days. When it reaches a temperature of about 1 800° F, it is transferred to the melting furnace which has been heated meanwhile to the same degree and the temperature of this furnace is brought up to the melting p int of according to the type of glass to be melted

Then the raw ingre-dients which have been previously mixed as cerbing to established tim dae are filled in the pot at intervals ingredients em placed depend upon the kind of glass desired. They are essentially the oxides carbonates and nitrates of certain in tale of arsens and borax etc. A glass containing (Continued on page 469)



### The French Problem of Reconstruction—II

Thirteen Billion Dollars' Worth of Physical Damage

By C. H. Claudy, Special Correspondent of the SCIENTIFIC AMERICAN in France

I must not be understood that all the destruction was How aked in Trance is a matter of at me Tuilding pass burns. It isn't. It sadestru trin if a rathing v n f the hand of which more in a met it. The mutter of public works in g n ril and nulroads h matter of pulmi worse in general and its annual praticular. Two fullion [Three is the strength works full for dringues. [which \$200 000 000 is 1 the North ultrand with his tell \$11 lt fs and 138 stations in t() mention the left is \$10.00 000 over the Grands distributed that full radii is \$10.000 000 with of cambe destroyed the last rultrand is \$10.000 000 with of capatre to \$10.000 000 with of capa

the last rule and  $\tau$  is \$1 0.000 0.000 with of repairs out replace forms in 1.1 it routs of hard \$50.000 0.000 to \$4 \text{ far hark is \$1.12}\$ the until out 7.4 \$5 0.000 0.000 to \$4 \text{ far hark is \$1.12}\$ the specially faint of st Birs, but has \$1 \text{ but the Korbe was apply faint of st Birs, but has \$1 \text{ Total apply the total by deuteroid and cv r 1.000 sch ols gene beyond anything short of relimitation. short of rebuil line

short all reduction.

Over one that and industrial plants have been arred to the ground. This cas more serious matter than merely destriying the fauldings for an industrial plant has machiner models patterns give and plans all of wheah must be daplie (t) after the buildings are displicated after the buildings are displicated. must be diplicated offer the buildings are disphared of for the indext can resum and then the commitment of the commitme

smooth generation of buildings (this pared with a more careful and clabor ate census of destruct in made in crtain districts a year ago. But the figures are probably and a rather than

These ligares includ 8 500 000 cubi 

And all this building material sur-rounded, in the form of houses fur-niture and personal belengings which even a conservative hismance company values at \$1 box 000 000 and the rnment at \$2 02 000 000

Reference was made a moment age to the damage to land it is at fir t glance not easy to see how earth is lo be damaged. But consider the most superional damage of all the putting in place of barked wire entanglements. One thinks at home of barb wire is a httle fence set up between trenches in No Min's Land Then ne course

No Min s land Then necoures Cover here and sees the fact index and unles endless miles of birbed wire not in orderly fences but in twisted masses and libes miles and miles are not only in length but in depth. Behind the Verdun bettleonly in length, but in depth—Behind the Verduii battle-fields where the German Lifth Army was stationed for so long, there is enough Little dwire in position to require mother ax months bombardment to remove

There can be no filling of the soil until it is removed a long slow tedious process, involving the expenditure fundinons in Liber to cut, to drug to bart cd sire graves—
else the expenditure of precious years watting for
nature and riset to remove this hideous wart on a fair
hin. One piles sebarled were from orderly rolle quickly—
sily. One displaces it by blowing it to late or
ly drived bean labst during peace, and the birthed
sire duringe is the least which has been done to the

The barbed wire publications have some unexpected lutions I anks have I on used to drag it from the find with great success. In lod in more than one American action tanks hooked in to barbed wire entanglem at and literally pulled it from the earth for a quarter

in nes and interany patient it from the earth for a quarter it finds, it for troops go through It should in take a very great amount of ingrining it produce a mechan with heavy follers not prinaise insumiter to a rock crusher into which this mass of wire and piles might be fed and which would turn out at the other end an endless rod of wire and crushed wood of varying dismeler according to the amount of wire. This tangled mass compacted by the machine could be chopped into lengths and those lengths used for reinforcements in poured concrete work put forward to the writer by a solder sugmeer, may be but one of ode as a snyone of which might aid in the barbed wire problem. But whatever method is used it must be ware problem. But whatever method as used it must be a new and an ingenious one, and it will take money and machinery and initiative. Whether I rance has any allow time to be a factor, she has not said and certainly the present a rube will not stand and certainly the present are will not allow the method to the like great damage to land has some from intensative shell time. Whill which exploits broath the surface

of land churns it up buries the top soil and brings earth to the top which will not grow even a weed. The inerc to our top white will not grow even a weed. The inerce
physical disturbance of the land, the making of a tillable
field into a series of hillocks and holes is bad chough, but
even if leveled off, such fields are still worthless, since even if leveled on, such fields are still wormness, since years must clapse before the soil again becomes fit to grow crops. Of 8 000 square miles in German hands in May of last year 6 000 square miles were tillable for crops and most of the rist fit for his and maximage. It and most of the rest fife for his and pasturage to river as some of the fifth for his and pasturage to represent a some of the finest agricultural land in leastful France. Ten lavaded dypartments in 1915 produced \$400 000 000 in crops. Here regume are prilaps 15 pre end of the tillable area of I rance and produce 20 per cent of her crops supporting 800 000 people or 10 per cent of the working agricultural population of I rance All this, of surse, is history
The land is idle now and will be for some time to come
and a quarter of a million acros of it will not be cultivated



Chateau Thierry after the Germans had retreated, July 27, 1918

sgain fir many many years, unless size use finds a way of turning bottom six its top!

There are thousands of sad mints of de-troyed woods One wanders through the Argonic forest or what was the forest, one, and satches one a breath at what the Americans did there. But one railra too at what so call trans the Argonic forest is a nume. The trees are but stumps Shell fire does to a wood that which must be seen to be understood. A western forest fire is far disastrous, since it, at least does nothing to the

Ibink of 250 000 little farms all idle! Think of \$80) 000 000 of farm land, unproductive. Think of the \$80) 909 000 of farm land, unproductive. Think of the mare ultimal instruments deserved and richne, which must be replaced 50,000 and hill ploughs, \$3 000 other ploughs \$50 000 cultivations 90 000 movem ganchinas, 115 000 firm wagons, \$8,000 harrows 50 000 plous 30 000 seed stills, 1500 fertilater persident fo 000 hert cultrations, 21,000 movement, such as the production of the cultration of the production of the productio

in dollars is much like estimating in dollars for human life destroyed. The wife who receives \$19,000 insurance when her husband dice has a fence raised between her and poverty, but does she consider herself paid? Germany may pay to the last dollar for the damage done to leave but destructs but as

many may pay to the last dollar for the damage done to I rench industry, but can any payment ever compensate for the time the product, the effort wasted? But again one confront figures and dollars as the only available pigments with which to aketch the run. So one starts with 20,000,000 of dollars destroyed in the coal regions, and tires to understand what it means when it is said that 70 per cent of France s best coal produced in her own lands, same from the invaded regions and that 100 000 fersoloment on the first which were for 140 000 Frenchman worked in coal fields which were for years in German hands. Three quarters of a million people depended on the coal mines for a living, and while propie deptation on the road makes for a living, and white France has her mines again getting them under produc-tion once more and rehousing the minera and their families is a task which may take years. Half a billion dollars worth of machinery in 100 and steel mills are destroyed or takin 100 Germany Ope

hundred and twenty milions of damage was done the toxtale industry. There were 210 sugar refineres in textale industry There were 210 sugar refineries I rance in 1914 Now there are 70 Is it any wone that the san harme bottle is a commonplace in the French restaurant the sugar bowl an unknown dush?
Of 3,000 brush factories two-thirds are damplished Of 3,000 brush factories two-churds are damoussies.
Fifty millions in electric power statuous are gone, producing 300 C00 k w, and that power is needed now Breweries have lot \$22,000,000,\$100,000 000 on small machine shops has

been ravaged to fill Hun factories or Staty millions may and may not cover the foundries loss, and none of these figures cover land or buildings Moreover machinery is three times as expensive today as it was four years I rance calls her machinery bill for destroyed or stolen engines of

industry \$4,000 000 000

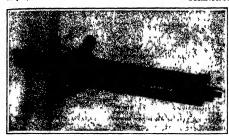
And \$\text{st}\$ one might run on for pages
Twolve hundred thousends acres of
furest destroyed Output of coment
now badly needed, reduced from
3 000 00X to 400,000 tons a year Ten
per cent of her lumber, \$\frac{1}{2}\$ per cent
of her firewood are gone One wanper cult of the furnishing of the firmwood are gone. One wan-ders through a soa of statustics and wonders which is the ruddiest in color, the most flaming in horror. One statistician with an imagination has calculated that if I rance could put 500 000 building tradespeople to w and for 20 years they did nothing but rebuild and repair the damage of war without starting a single new project, France might look, in 1939, as she did in 19141

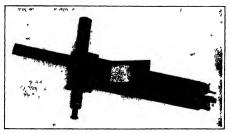
did in 1914!

The total physical damage is estimated as some \$13,000,000,000. The human mind does not compresend 1,000,000,000 area as a name. One cannot adequately realize 1,000,000 let alone 13,000,000 0001. This, then a the problem, murely the physical aspect of the problem, which Franco faces. That she must still maistain her army, look after her army of occupation, conduct her business and her government, take case of our vounced and her refusees, find work for her helplass have a supplied to the control of the control o tackled her 1 beith the same high courage which made the blue coated sidders invincible at Verdun One looks in vain

hissociated singless invincines at vertur. Onclocks in vain for any expression of discoveragement, of fear, of anniety. The Hiss is out of France: The future is before her The great fact of the present is that the war is over and that be the problem of the days to come what it may in difficulty, it cannot possibly be so had as that of the years when no man knew whether peace would come with victory, or with annihilation—it was never thought by any that it could come with defeat

Cattle have dummabed in these regions by over 50 per cant. The loss in wheat is 1 90 000 serves in hay 80 000 serves in heap 80 000 serves. Although the serves of the serves





The visibility mater ready for action

Visibility meter open to show its working parts

### Increasing Visibility Through a Knowledge of Camouflage

Suggestion of Permanent Peace-Time Value Drawn from the Efforts to Make Ships Invisible By Robert G Skerrett

I T may be said without fear of contradiction that we have shifted marine camouflage from the field of a A nave sauted marine canonings from the netto or a debatable act to the realin of scenee . In doing the we have settled a number of vaning questions and we have achieved results that are likely to be of the highest value in the days of peace. This may sound paradoxical but it is only proof that principles when thoroughly under stood, are susceptible of application in radically different

The public has already been told of some of the results obtained by us in seeking to develop systems of protective coloring for our shipping systems that would either induce a notable degree of low visibility at gunfire ranges induce a notable degree of low visibility at gunther ranges or mislead the man at the priscope through the effect of dassis." or confusion After we had been somewhat as war with Germany we were still groping an our efforts to evolve a really natisfactory order of marrier camouflage. The constituted Folorial authentiess actually approved five mer. or less radically disamples are system—the products of five New York ratists who had tackled the problem from as many different angles. In a very large measure their essays were essentially empiri-cal, and each was pardonably certain that his was the

We should probably have gone on guessing just as our Allies abroad did throughout the war in this department of deception had the question not been attacked by the Submarine Defense Association and through it analysed and investigated in an exhaustively techni al manner The Submarine Defense Association was called into being by something like a hundred steamship companies marine underwriters and others interested in nautical matters, and its primary object was to devise ways and means for either dodging the U-boat or minimising the effectiveness of its offensive weapons Naturally marine camouflage was one of these and the association realised that the selection of the protective coloring that wanted that the selection of the left to personal opinion
It was perfectly plain that some scientific basis of com
partion had to be established and agencies developed
where none existed that would evaluate with precision

paraon had to be established and agencies daveloped where none existed that would variate with precision the relative turnits of rival camoufflage designs or methods to put it popularly, the comparing camoufflage was all from Missouri, and, what is more to the polat, it was accessary to mice them, seek for Int. On the polat, it was accessary to mice them, seek for Int. On the polat, it was consumed to the control of the following the committee of the Bulmarian Defense Association secured the cooperation of a herge ensure when seek of the polatic properties of the Superaction of the Engagement shorestory and the services of its eminent experts in high, tooler and optics. The whole story of what followed is a fascinating one, but cannot be told now. The finisher of the commendate interest is an instrument, investedly and perfected by Linyt A. Jones of this commendate interest is an instrument, investedly and perfected by Linyt A. Jones of this commendate interest is an instrument, investedly and perfected by Linyt A. Jones of this commendate interest is an instrument, invested and perfect of the Mcditternants frequented by hostile-substantants. The appearation in question is the visability and the Mcditernants are probably was also affected by the proposition of a column value in the control of the column value is a superior probability of the column value of the column value of the column value in the column value of the co

will stand out in vivid contrast against a liminous sky background but that a ship moving away from the source of light and toward to roppen to part of the horison becomes varyingly wail is not by reason of the background but because of the amount of light which its surfaces reflect and the intensity of the chied was east by various features Therefore the aim of the camoufleur is to reduce this reflection value and t ) promote an appearance of flatness by brightening up the shaded areas through the employment of white light blues and grays II is a matter of knowledge among technicists that areas of pink violet and green will melt into a uniform gray at a suitable distance, and that this gray will be either warm or cold according to the preduminance of the pink or the two opposing colors violet and green. On the other hand a gray can be produced by a similar merging of areas of white, blue and gray with portions of black. These suitably varied in their pr p rtions yield grays of low visibility admirably suited to the anditions imposed

The man in the street will probal ly want to know just the man is the steed will probably want to know just how the scientists of the Visionarius Delenek-8s (1) thou rhose the contings finally adopted -Oinega gray and Psi gray In abserving the sky grays characterist to the two sections into which they divided the submarine danger are it was noticed that the klasses or perisopes employed for this purpose allowed promistic Ohrs.

| Model             | Турк                  | Weather<br>Coefficient | Dogree of<br>Visit iii y |
|-------------------|-----------------------|------------------------|--------------------------|
|                   | *****                 | ·                      |                          |
| ¥ 20              | Light Gray            | 43                     | 0.3                      |
| r s               | Light Gray            | 4.3                    | 0.6                      |
| Louis Herzog      | Low visibility dazrio | 43                     | 4                        |
| W A Mackay        | Low visibility dazzk  | 4                      | 4.4                      |
| MIG               | Low visibility dazzle |                        | 6.0                      |
| Plentbner         | Dazzie                | 41                     | 7 2                      |
| E ! Warn r        | Dazzle                | 42                     | 72                       |
| Comez             | Low visibility        | 41                     | 7.5                      |
| G Brush           | Low visiblity         | 43                     | 7.5                      |
| W A Mackay        | Low rigibility        | 4                      | 8                        |
| Patterson Sargent | 1)asale               | 11                     | 11.5                     |
| Shorwin Williams  | I ow wieibility       | 41                     | 10.0                     |
| British           | Dessio                | 42                     | 15 0                     |

Visibility of models tested by the Submarine Defanse

around their outer edges, r. th. well known, r. rogaeffect. There when analyzed by a speed we ope,
speaked to the coapponents of the grave, she of the
dertain blues and whites were found to the coapponents
with the dat to offect upon it was but a maniter of
patient experimenting to discovery just how these colors
outly be laid on in bands other kered pottering, etc. to
give the deer of deceptive qualities at a thousand yeard
or so and to make awey into a low winbuilty gets \$45,000
wards Add m w. for the instrument devised by Mr. Jones
when the standard of the second o

of it This condition is very common at sea, and an observer will frequently fail to discover land or a passing

ship hidden by an intervening screen of this character. It is just this phenomen in that Mr Jones has used as the basis for his visibility meter in order to gauge the light posely creates a diffused light or luminous veil between the eye of the olserver and the model to be measured and when this sere in is strong enough to obliterate the image of the miniature ship a register indicates the actual ibility of the obscured model

The visibility meter has the autward appearance of a telescope projecting through a suppring retangular case of some length. In this case is a small electric hills which can be moved virtually through a considerable where can be moved vertically through a considerable distance and the past in a fittle lamps insiderated by an index hand passing over a graduated said. The light from the hubb passing over a graduated said. The light from the considerable passing the lamps had been districted as an of sight of the lamps back to the even of the observer. The mirror is wint or unlar disk will be even of the observer. The mirror is wint or unlar disk will be considerable and of the lamps of the metallicity of the observer. The mirror is wint or unlar disk will be considerable of the lamps of the metallicity of the observer. The mirror is wint or unlar disk will be considerable of the lamps of the metallicity of the observer. The mirror is will be considerable of the lamps of the l diffused hars ter and its intensity is differented en-tirely by the verti all positi is of the incan less out bulk in relation to the more

As the tamp is shifted up and down there is moved in unison within a wedge-disped in uniter I is straig gray gloss which tempers the brightness of the light coming from the natural sky or the backer and behind the model and reduces per portainals; the apparent vivid most of both the lasker und and the cui uflaged image nose of both the let kgr und and the cun inflared image. The makes it possible is comply as solubly a lamp of modest candignose; if r the princt in f the vehice glare. When this glare is stall bent strength to shut out the object or t make it seem to merge with the lack ground then the redding of the instrument gives a true measure of the visibility of the model when yie well assembly in the novaling ladds to optically a second to the novaling ladds to optical.

normally in the prevailing light conditions

A careful analysis of weather reports covering the region in which the majority of the ships were sunk by submarines revealed that 70 per cent of the days wer loudy and from this data the scientists of the Sub-marine Defense Association determined upon a reflecting marine Designe Association determined upon a reflecting power of 45 as a weather factor that had generally to be considered in meeting the requirements of 1 w visibility. This point is of interest because it bears directly upon the relative monts of the products of actual camonificurs and relative morte or the products or actust camounters and the cubres and syndings at the dupon by the accurate of the Assonation. The accompanying table is based on analyses of computing designs which were tested by the visibility inster. Models 1 20 and 1 F 9 wags prepared by the Assonation and Molles 1 20 and 1 F 9 wags prepared by the Assonation and Molles 1 20. show the extrema degree of visibility obtained through the employment of a uniform coat of black

Invasibility is represented by zero and the visibility of the various models was rated as if they were viewed at a distance of 6 000 yards. Omega grav developed for the northern dauger some has even a lower visibility than that understed by Models 19 and 120. The U.S.S. Germ which was used by the Association for experimental purposes showed a visibility as low as 0.2 in clear weather at 1500 yards and was invusible at a

th thear weather at 1 does yourself the same of 3000 yards.

The layman will probably ask Of what possible peacetime uso is all of this scientific work and research. (Continued on page 471)



Three views of the Bolrauli tank, showing how the hexagonal framework is operated so as to lay rails for the engine-bearing member in the center

### The Invention That Won the War

### How the Tank Idea Was Conceived and Progressively Worked Out

THIS is a story. In wonderful ides which was progvention probled by the war. Indied which besiding in wention probled by the war. Indied which besides on and that brights of or the winning of the great war the leading authorities and studies of the strangel have at least at said these immedied than by starting in clear unmostanded language that this great Whird invarian the tank was the dreamy factor in the fundam analysis. If the skillable intrinsic held carranges

must some the transmitted at the vertex. The tank of a regularded at the vertex days of 1914 who is the Germans swept over I rance and belgum met differ at the Marne and islical lack some distance only to intrine in themselves behind containing belts of birthed ware. Then the British and I runk treef to break the might the barbed wire and the German trinds were a made with a different cost in blood and treasure. The Germans realized the diffusive value of turbed wire backed up by machine gun underficher. In fact, they halded millions of strong well trained Russians who rolled on up to the backed up by machine gun underficher. In fact, they halded millions of strong well trained Russians who rolled on up to the backed up by machine gun underfichen and the development of the discussion of the strong well trained Russians who rolled on up to the backed with the defenses in the national to be along the related to the tree of fenomes.

Thus the inventors set to work to find some way of getting at the German mas hone gunners behind their barbed wire balts. While intense shell-fire served to cut up the barbed wire, it was a crind measure at best Days of bombardment were necessary before a dense defense could be reduced and by that time the enemy had ample opportunity to make such dispositions as he thought necessary to must be imprending attack. Obviously, some quicker and inore efficient method was necessary some in the world return the vitally

important dement of airprise for an important state of a November 1914 a French instant of L. Breton, forwarded a plan to the French Minister of War, covering an armord automobile togoe driving a circular saw for cutting through barbed wires and their supports a formation of investments an innominally appreciated the military possibilities of this idea, and encurraged the investor to go should with a model. In January 1915 experiments were carried on with the type of machine about in one. It is accompanying

By an ingenious arrangement of track sections and steel cable, inventors sought

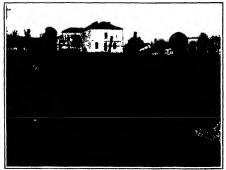
illustrations consisting of a six-hoise power gaseline engine driving a circular saw held at the extremity of a privoted arm which could be enquised so as to bring the saw to bear at any angle or beight. While the experimental machine was mounted on a simple factory trunk the actual military machine would have been mounted on an armored ear driven by the same or a separate engine. But the inventor and military authorities snow came to the conclusion that the metry tank would have to be more powerful and in easting about for a suitable vehicle they came upon the familiar

agructivate tractor with continuous exterpillar belix. At that time, however, it was impossible to secure an agricultural tractor although M Breton and Major Bosson of the technical socion of the Fruesh engineers, realised that an American tractor was the ideal mount Sot twas finally with a Bagui tractor, placed at their disposal by the end of February 1915 that the experimenters conducted their tests Mounted at the rear of the Baine tractor was a powerful set of shears, degreed by M results of the second of the se

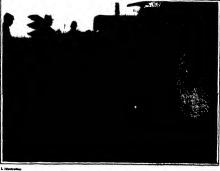
intended to saw the wooden supports of the barbed were a few inches above, the ground. Obviously the tractor was oper acted backs are in order to bring its estimage normbers into action. The shears worked larrly will but the saw performed some absolute of the same and the same action of the same a

while caused the Iranch army to order the first 10 caterpillar tanks of the Schendist-Crusest type on December 7th 1915.

Meanwhile other Iranch inventors were at work, notably Mesers Turnol Irot and Laffy, who followed out the idea of utilizing the usual road roller for the flattening out of barbod wire estanglements. In the state of the Engineers of the French army could be a supposed with a colored process of the French army couldness of the Fr







Barbed wire cutting member of the Breton-Protet machine, with the horizonte

three machine guns and was intended for a crew of terror ascume game and was intention to a view eight men—two mechanics, a commander and six fighters. When it came to getting over the battlefield and through barbed wire, the tank was not a success. In the first place, it could not operate over rough ground and over terrain which happened to be boggy secondly, it only crushed down the barbed wire which, after the passing of the tank, again rose in place to impede the

passing of the teat, again rose in place of impate in infantry waves
Another interesting ancestor of the tank was the machine of M Borrault which was examined by the French army authorities during the latter part of 1914 Resentially M. Bornuit's tunk, which is shown in one of the accompanying groups of illustrations consisted of an iron structure carrying an 80 horse-power gasoline engine. The power plant through a set of endless chains served to drive a set of pinious which in turn operated the power-carrying member along the track laid down by the hexagonal from

work I hus cash articulated acction of the hessagonal framework was laid down in its proper turn on the ground, and the powerearing unit rolled along on the short soctions of track, just as the aterpillar tank lays down a tinuous track for the body of the machine Barbed wire entangle-ments and shell holes and trenches were found to he readily spanned by this novel contrivance which which 28 feet in length, and weighted about 40 tens. It had a speed of about two miles an hour

In a series of experiments this novel tank proved quite practical for getting across buttlefields, but it failed of acceptance because it This objection was overcome applying a screw jack so that one side could be raised free of the ground so as to apply the driving power on the other side Still this procedure required too much and again, the tank was difficult to arm and still more

The technical section of the with the arming and armoring of agricultural tractors of the hitz type, which were equipped with an inclined cutting member for hacking a way through barbed win Driven by a 45-horse power engine these tanks were capable of 7 to 9 miles an hour in either direction In all, 10 such tanks were constructed, each armed with a single machine gun Against taut wire. machine gun Against taut wire, these tanks functioned pretty well, but when it came to slack wire they were of little value During August, 1915, they were sent to the 4th and 10th French armos for use against the enemy On being tried near the battlefield, however, they proved unable to cover the rough terrain and were returned to the rear before the enemy ever new them

Still another attempt at the sudden destruction of barbed wire was the electric torpedo of Messis Gabet and Aubriot, which was intended for the transportation of some 200 to 400 pounds of high

explosive to some suitable point in the enemy s barbed wire, which could then be blasted at the desired moment. triple caterpillar belts, driven by an electric motor Power for the electric motor was conveyed through a special cable which was automatically laid as the diminu-tive tank traversed the hattlefield

In November, 1915, M Gabet constructed an almore

in November, 1915, M. Gabet constructed an at mored celectic state, earrying either a machine gun or a 14-sinch quiek feer, with a crew of two mon 1 he electric power was supplied through a cable lawrestons are prollife people and never was this better linearised than in the earrying out of the tank idea. Thus the lawendors turned to other monan of crossing the chaotic bearing of bettileleds, that yims using ordinary decision of the control to the cont (Continued on some LTAY

### How Long the Oil Will Last

As an interesting sequel to the recent discussion of the probable duration of the coal supply for the world as a whole and for certain countries individually we present this week a series of graphical comparisons got up by our British contemporary the Illustrated London ens with regard to the oil situation. There has been wholesale discussion of this matter and the opinions expressed have varied widely—the particular period gned to the world's petroleum supply by any one assgared to the world a ptitoleum supply by an one authority being cordinarity, a function of the faith placed by that suthority in abade oil. He rick which shale, oil steeplay must of course eventually be a considerable one but just how considerable and just how eventually no no one todax on very well say. A cordinary the virtual who due the puttures which we reproduce appears to have been under metriculous, by agone is allogether. and to make his metures talk ab it untural oil from well-

from service to the overlasting benefit of the oil supply and the commercial user thereof. So it seems commently reasonable that the compiler of these figures be repr sented by m and of a large question mark the length of time during which the world will still have oil to bare We cannot help commenting unitered by up in the period which has been assumed by way of comparison

period which has deen assigned to water it comparison to the American cold indistry. As we ignited but in our recent the cassion of cold the figure 4000 cs indical the quotent of visible resources by present annual con-sumption. But our consumption to declaration rease with samption and our ross is a strationary say as w leplete them by use Incle I the exit related between vesible resources and consultably vesible. r sources is still a very op it opi sti Can we affor i to use pritty much all the cold that the trealogical Survey tells us the ground centums or can we bring ! the suface ally a small fraction thereof at pures withou

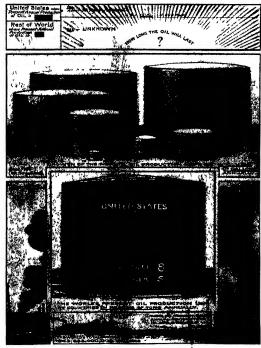
the reach of the manufactor rand the householder? On this point n find a conflict of authorities and a conflict so sharp that while one person who ought to know what he is talking about suggests 1 500 years as the period during which we shall be funneially com-petent to burn coal another gentleman of equal standing in sists that during the life of the present generation of adults our it is concerned. But in any event we shall not have coal for 1 000 years unless engineering triumplis structs and a service and a service undreamed of provide sub-stitutes for much of that now burned of ways of stretching the supply out to an amazing degreof longness and thinness

If the United States is the world s greatest producer of solid fuel it holds the same position with regard to the liquid combustible. But where China has coal re-sources which if developable and developed will make ourselook like i plugged nickel this does not ap pear to be the case with oilother region of the world are the present his producers and as far as can be forescen we are the big producers of whatever of future the petroleum industry may be destined to enjoy.
To any question which may be

asked bearing upon the reason why exhaustion a ready suswer is offered by the course of past con sumption and the extent to which it has depleted the petroleum resources Starting from infinitesimal proportions in 1857 oil production and consumption grew like a huge snowball—grew in a interest law completely shade so far as any such beggarly rate as six per cent is concerned.
Of course when we start from nothing or from next to nothing to build up a thriving I usiness wi expect to see colossal rates of increase be use something is bound to be a large percentage of nothing, so we is clust be startled when we not that from 1860 to

1870 the p to learn consumption increased about 1 100 per cost and from 1870 to 1880 about 500 per cent. But by such mercases the industry
was placed on a very sulstantial basis, so it does afford food for Hought when we are told that during every decade from 1880 to 1910 the ainual consumption of liquid fuel was at least doubled so that in 1910 it was more than eight times what it was in 1880. And since 1910 it has more sed about in the sum ratio so th normal course seems to be represented by a doubling overy 10 years

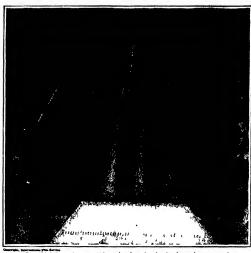
What this means to the customer is obvious enough what this diffulls to the engine is obvious clough Are we going to have eight free is much oil to burn in 1950 us in 1920 I in this ills we are not We should be singularly fortunate if it turned out that w were to have at that 11 17 000 000 000 g Hz to burn in the sem saide is in 1917. This is where the punch cames. If a simption were the sem from you (Continued on page 4"1)



The source, extent, and probable duration of the world's annual petréleum supply, as pictured by the Hiustrated London News

exclusively, the period allowed for the complete ex-haustion of the American supply is just about equal to that ordinarily cited for the probable life of our oil

If the United States has oil wells to last 30 years, it is confessed that he corresponding figure for the entire world is an unknown quantity. On a basis of previous rformance, it would appear that the world a supply cannot last appreciably longer than that of the United States since it is clear from mother section of the diagram that we are at present producing something like 71 per cent of all the oil that is taken out of the earth like 71 per cent of all the off that is taken out of the earth Yet the Mexican production and the possibility of here tolors undeveloped fields are such complete engines tolero didevisione and a place in point them and we have even hand the miggestion seriously advanced that the Langue of Estimate would work as well that a wast fiter of obtaining war ersit could be permanently retrod



The "Idaho", our istest 32,000-ton dreadnought, showing forward turrets, each mounting three 14-inch guns



Dertisk, Universit à Universit Looking down on the fire-control platforms of the "Idaho" from the Brooklyn Bridge

### Our Latest Dreadnought "Idaho"

One of Five U. S. Ships Which Are the Most Completely Protected Warships Afloat

WITH he completion of the dreadnought 'Idaho," saster stip 1: the 'New Mexico and 'Mississipp our battle flect includes he great ships, the largest battleships affont all of which carry a battery of 12 1-4-inch 50-aibbr guas and a torpedo battery of 22 5-inch 50-aibbr guas and a torpedo battery of 22 5-inch 50-aibbr guas and intorpedo battery of 22 5-inch 50-aibbr guas and intorpedo battery of 22 5-inch 50-aibbr guas and into great ships, and a storp of the same than a storp of the same than the same

study their design but it during training yeared in the light of the varie is equitable to the variety of the property of the

The remarkable character of the underwater protection of these ships as shown ever charly in our photograph take from a pind above the main deck of the Marylail is which is now under construction at the property of the ship and the second of the contraction of the process of the contract and of the ship and the more wall enclosing the engine and 1 die root is magazinis etc. there, are no less than four longitudinal walls, microstring the numerous transverse halfship is and subordinate transverse partitions. Thus there is provided a broad 1 it 1 to 15 feet in width of cillular were the compartments. The force of it of the other is provided a broad to expinite the rupturing the tough steel of this construct in said its tearing and buretting curvey will be so for absorbed that, by the time it eached the inner wall, many and its of the construction in their ships to such go 1 fifest that when the battle-cruiser. Goods is was taken over after the aimstite it was found that though she had been torpedoed or mindel no less than five times, and although the innermost walls protecting the engine and boiler rooms were bulged inward, they had held Similarly alth ugh at least four of the German battleships were torpodoed at Jutland,



Deck view of the 22,300-ton "Maryland" shows the wild said the land of the struction, which will enable her to survive the liberard same it transfers

they all succeeded in actting back to port for repairs. The "Idaho is 024 feet in length 97½ feet broad, has a maximum draft of 31 feet, a normal displacement of 32 000 tons and a full-load displacement of 32,000 tons and a full-load displacement of 33,000 tons.

Her beit armor is 14 inches thick and in decreasing thickness is carried up to the main deck. She has 18 inches on the portplate of her three-gun turrets, and 18 inches on the conning tower. She is driven he Paraune turbines operating outformant. Her speed at full power is 21 knots. Ih boilers are oil fired and the ship can stow in her double bottom over 3 000 tons of oil fuel

### Homing Pigeons for Forest Fire Protection

Protection

THE State of Minnesota and the Canadian government have adopted the system of Huming Pigeno Communication devised by Philip F Edelman, D.E. for Forest Lire Protection This system provides reliable communication under conditions impossible to wire and wireless methods in wild countries. In a given area, a house next is established at head carry two hirds in a speedl carrier on their back, or kit, or in their canade. If american, a color good of the carry two hirds in a speedl carrier on their back, or kit, or in their canade. If american a second to the carrier of the carrier of the carrier of the carrier of the second bird with check mossage to issure delivery. The weight to be carried is thus less than any fig deed the beneditation to which they have been trained, at about 60 man per hour, where 15 man and 15 min and 15 mi

### The Most Powerful Gun in

In the continual race between gun and armor, the gun easily main-tains its land. Even the 11-inch and tams its land. Even the 11-men and 12-insh guins of the German fleet found no difficulty in penetrating the armor of the British ships, and it is only because the heavier British projectiles carried a defective delay-action fuse that they failed to get through the heavier German armor in thew of this superiority of the gun, it may seem surprising, at first thought, that the size and power of heavy artillery has been increasing during the war at such a surprising rate

following table showing the continual enlargement of calibers and corresponding morease in the weight of projectiles, shows the extent of this development at a glance During the past decade we have seen the heavy guns of battleships and battle-cruisers

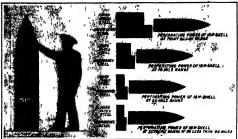
guns of Dattleships and Dattle-crussers grow from the 12-inch quin throwing an 850-pound shell, to the British 18-inch gun throwing a veritable monster weighing 3,600 pounds—an increase of 50 per cent in caliber and about 450 per cent in the

| TABLE SHOWING INCREASING BIZE OF GUNS |                 |  |
|---------------------------------------|-----------------|--|
| Caliber of Gun                        | Weight of Shill |  |
| 12' paval                             | 850 pounds      |  |
| 14" "                                 | 1400            |  |
| 15"                                   | 1925            |  |
| 16* *                                 | 2100            |  |
| 18* '                                 | 3600            |  |

According to Sir Robert Haddeld, who specialises in the manufacture of amon-percept shell, the 3,000-pound properties of the two 18-neth guns which were first mounted on the battle-cruser Furnous and later on one of the British monitors are by far the heaviest amon-plexing abelies were fired. The gun, according to Engineering, waspin about 100 tons, and at its maximum elevation of 45 degrees it can throw its projectle which is 18 inches in diameter and 7 feet in length, to a distance of about 50.000 yards, or say 30 miles. In the trials of the gun, the shell, fired at a velocity equivalent to a range of about 11 miles, perforated a hard-faced plate 18 inches thick, which means that at that range which exceeds, by many miles, the most extreme battle ranges of the late war, it would pass through the heaviest armor affects. According to Sir Robert Hadfield, who specialises in affoat

The perforating power of the shell is shown graphic ally in the accompanying engraving from which it will be seen that at point-blank range the shell would pass through 41 inches of face-hardened armor which is through 41 inches of ince-hardened armor which is equivalent to a mass of steel 54 inches in thickness At 10 and 20 miles respectively, it would perforate 22 inches and 12½ inches of face-hardened armor, and at the extreme range of 10 miles, it would get through nearly 12 inches of face hardened armor

Now, if, in this high shell the proportion of weight of high-explosive filler to weight of shell is 15 per cent, it would mean that when the shell burst within a ship over 3,003 pounds of steel would be hurled in every direction



The shells of the British 18-inch naval gun—the most powerful weapon in existence Used against Zebrugge

under the hursting energy of about 500 pounds of high

Supposite

But how can a sabip be bit at such distant ranges
where she would be bull down to the ship that was firing?
The answer is to be found in the modern naval method of directing the gun-fire by sirplanes launched from the ting the fall of the shells would send the results back to the firing ship. At these ranges shells would full at a very steep angle, and the problem that is worrying the naval constructor today is how in the mains of the impossible is he going to provide sufficient deck armor to keep the shells out. It begins to look as though the only defence of the future will be high speed and the steering of the attacked vessel on a continuously singous course

Testing Automobile Tires on a Factory Roof OC VII D on the roof of a large factory building in Deuver Colo, as a most novel track and mechan am for the testing of automobile trees which has been made the subject of the cover illustrate in of this issue

As will be noted in the accompanying illustration this track and mechanism is arringed to simulate the this track and mechanism is tringed to similate the average conditions encountered by an automobile. The tire is attached to the free end of a pivoted aris and is driven over the track by means of an electric motor. surven over the track by means of an electric motor Switches and rheostate are provided for controlling the driving motor while a standard spee dometer gives the total milesge and speed. It track or 'road is quite a composite affair, part of it consists of loos rock, another of loose paving blocks still another riprism is a railroad crossing, and so on to simulate very kind of road over the best animal control of the contr a railroad crossing, and so on to simulate very sine of road over which a pneumatic tire is expected to travel. In fact part of the track is arranged as a double incline so as to give the effect of grades. Whirling about this so as to give the effect of grades. Whirling about this bigging directly read the tire receives a thorough test and nat 1000 5,000 or any number of inites traveled it is possible to determine the extent of we ir and tear

### Shell Shock or Neurosia

THE Medical Department of the United States Army has found that the early conclusions regarding shell ock are not true. There is really no such thing as shock are not true

shell shock although there are many cases of war acurosis. War neurosis really not different from neurosi found beyond the war rone

Neurosus whether found in the Army or among civilians is a subor scious desire and the physical condition induced thereby to avoid a his comfort. In the Army it is a sub-consecus desire to get to or to remain at the icar. However it does not proceedly f llow that the patient is lacking in ourage for there are many cases f war neurosis induced by the mental attitude of the patient concerning promotions leave alleged favoritism etc. Among officers neurosis is often induced by the respensi-bility occasioned by the demands at

Investigation has shown that shell shock or neurosis is unheard of among prisoners although they may be in feirful physical or mental condition just as it is almost unheard of among wounded excepting those who are

shout to be returned to their commands

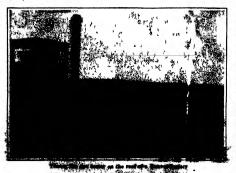
Finplies should be led in the fact that shell shock or neur sas is a sub cor seems attitude and a disease which must be cared. Here are comparatively few cases of patients faking

Many soldiers having neurosis will remain uncured even after returning to civil life unless the disease is thoroughly understood so that proper treatment may be given

### From England to India by Airplane

TTH the arrival in Calcutta on December 18th VV last of a Hundley Page airplane the first speek The landing of the huge biplane on the race course in Calcutta was witnessed by the Viceroy and I ady Chelins ford the governor of Bengal and an immense crowd of Europeans and natives to whom the second appearance of an airplane in ( alcutta was a great attraction of an arrivage in the deduction was a great average of the trip was made with all strings inshalp via kgypt and Mesopotamia a distance of about 6.700 miles by the route followed. An average speed of 85 miles an hour route followed. An average speed of 85 miles an hour was maintained and main stops were made. In original trip from London to 1 gypt was made for the purpose of militars inspection, and it was then decaded to continue to India with stops in Misopotamia for further inspection duty. I rout Delhi to Calcutta the machine carried stypt route.

There has been considerable discussion with reference to an acrial mail service between I ugland and India British Acrial Transport Committee considering that the trip from I ondon to Calcutta can probably be made in four days as against the minimum of 18 days via Brindist required by rail and ship. Investigations are now being made with a view to establishing an nerial mail service in India and it werns reasonable to predict that within a few months one will be in operation With the easily obtainable average speed of 70 miles an hour the journey from Bombay to Calcutta could be made in 17 hours instead of 46 by rail, the Bombay to Calcutta could Simils trip could be cut from two days to 14 hours and karachi would be only 10 hours from Delhi instead of 48





Taking the mileage reading of the tire tested over the roof course



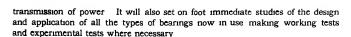
## THE S K F INDUSTRIES INCORPORATED announce the institution of a scientific organization for the study of anti-friction devices with the intention

- —of setting on foot a thorough and scientific study of friction and the application of more improved anti friction bearings,
- —of offering to American manufacturers in every line a bearing engineering service designed to investigate any manufacturers bearing difficulties and offer advice as to bearings exactly adapted to his specific needs and
- —of endeavoring through the bearing knowledge developed in this manner and through its scientific investigations to be of assistance to the entire bearing industry in the improvement not only of design but also of methods of application

With the conviction that American manufacturers will welcome assistance of a scientific nature in the solution of frictional difficulties the S K F INDUSTRIES has established a service, entirely scientific in its intention entirely divorced from the sale of any specific type, for the study of bearings in relation to manufacturing

Heretofore such assistance and advice have been rendered solely by bearing manufacturers as individuals. It is hoped, through concentration in one unified research, to organize the investigation of frictional problems and the giving of advice thereon in a more thorough manner overcoming the past limitations

The new bearing service will be both scientific and immediately practical. On the scientific side, centering in its engineering laboratories, which will be completely staffed and equipped for research of a difficult nature, it will undertake the investigation of the frictional difficulties and losses involved in the



On the practical side, the bearing service will place at the disposal of manufacturers, a staff of engineers who will go into the plants of any manufacturer investigate his specific bearing difficulties and offer advice as to the type design and application best calculated to remedy such difficulties

It is hoped, further, through the data gathered in this plant service to manufac turers, coupled with the findings of the research studies to establish resources of knowledge that will be of assistance to the entire bearing industry in the improvement both of design and manner of application

The S K F INDUSTRIES is peculiarly fitted to undertake this long-needed service to American manufacturers inasmuch as it represents a pooling of experience of two manufacturers whose past activities in the application one of the deep-groove type of bearing, the other of the self-aligning type have brought them into almost daily touch with every type of bearing. Combined with these is the experience of a company whose engineers energies have been devoted solely to the manufacture of balls, a phase of the industry no less important than the completely assembled bearing itself.

To those who know of the S K F Ball Bearing Company The Hess-Bright Manufacturing Company and the Atlas Ball Company this massing of experience and engineering abilities, further to be re-enforced by the study of bearings from the research side, will mean advice with the impartiality of scientific effort and resources of practical knowledge not to be equalled by any other one organization

American manufacturers are invited to avail themselves of this beam, service at any time

### World Markets for American Manufactures

Edited by LYNN W MEEKINS

A department devoted to the extension of American trade in foreign lands

### Miles of Cold

ski jigearfrom it rices unbl skil merchant SINIX cents for a lower level in she New York to Chang widdle bit than the present rates widdle bit she than the pressult rates a lithin tit. At 1 merchant from South Africa durin, a recent vise! I the Linted States. Date is the chair vis. I reduce the firm Cape Down to Jim South in the Linted States. Date is the chair vise bedding as we call it firm in the record regardless of legal to up draw, jet too offer a gester variety of field time. I very it os than those in America. They are up of 1 million to the chair variety of the distribution of the chair variety of field time. I we have the chair and a first state of the chair variety of the chair vari

ouple I from trains on rente The government of the Unito of South Africa controls 9 50) index of rubways and derives a print from them

South Afrian rulway resp 1 So far American manufactur ra have mide ittle effert to sell us ma ternals and supplies but not long ago an order was placed in the 1 nited States for 125 maintain lucomotives use on heavy grades. At the outbreak of the war the South African government cancelled a milhon-dollar contract with a Cerman firm that had previously fur-nished motive power. There is a very good chance to sell American railway cars Be trains have to make

through mountainous country I do not think all-steel cars can be used South African sleeping cars are divided into compartments and have side corridors The day coaches are generally similar to those in the United States. In normal years the total purchases of the South African Department of Railways and Harbors have amounted to more than \$60 000 000 Under war have amounted to more than \$50,000,000. Unter we conditions they have averaged \$2,000,000 so that a shortege exists in many stores and then is a good chance for American exporters to bill for this business. It has been exceedingly difficult.

### to obtain rails An Impres

'Arriving at Johannesburg the best object to meet the travelers gaze is an advertising signboard 800 feet long. The solver using signosure solver, only the posting of bills on this board is controlled by the railways which also operate met of the other or messions. Indiamensing with a population of 260 000 is the large of city in South Africa, although it was founded less than 10 years ag. The city of the in South Africa, adds upp it wests more asked and type are given from the first policy and th orplane in the comparatively near fiture

The tel ph is instruments used in South Mrs is are of Luropean make. It is probable that with hitle effort the superiority of America instruments could lemonstrated and the they would be I ught in onsideral le printities by the a vrap at which operates the telephone

out it tite, raph system to the present.

News and Sweden are seen the present of It is sail to be difficult to conduct a conversation over this line, because of the indistinct receiving apparatus The automatic telephone has not yet been introduced in South Africa

The merket for farm comment is attractive. Owing

to the high price of gasoline—\$10% per gallon at present the sale of engines dependent upon this fuel is much restricted. On the other hand, kerosene may be bought for 30 cents per gallon, and apparatus adapted to it is in more demand. For machinery cut his fittings and other material for electric light and possible purposes, the South African market is worth more than \$5,000,000 a year When nailway electrification is a lectaken and other new industrial projects are start 1 in urgent need will he created, representing very 1 1 h more in annual

Our suburban customers in South Africa-a native village

value than the gross total of all electric imports into South Africa in the past

### Joinary Planes in Demand

Before the war Germany conducted an extensive trade in South Africa in small to let of all descriptions expe-cially in joiners' planes. A areful study was made of the models chiefly in demand and these were supplied at praces which made both lugland and American

were those used for smoothing roughing and molding Among the white population of South Africa, which is approximately 1,500 000, American wearing apparel in medium-priced grades is liked As the additional millions of natives gradually acquire civilized customs, the sale of all sorts of clothing and articles of personal adornment will expand There is not much chance of adornment will expand There is not much chance of soling American leather goods in South Africa A man from Johannesburg brought with him a large, well-made brad-case of South African amultacture for which he paid \$50. The price quoted for the same kind of brad-case in the United States was \$85, he said A good quality of leather is produced in South Africa.

quality of leather is pro-duced in South Africa.

The American exporter has the choice of several South African ports to which to send his shipments. Cape lown is the principal import. center, but goods consigned to the interior had best be routed vis. Alona Rev. (Porto the interior had best be routed via Algoa Bay (Port Flizabeth), where conditions for handling such freight are far better, railway facilities far better, railway facilities as compared with Cape Town being more adequate, and goods receiving more careful handling. Naturally, Great Britain and its colonies have an joyed the larger proportion of South African Trade

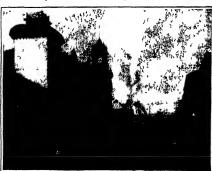
Among the merchants of the Union, however, America is one of the most favored

ations, and all manufactured products from the United States are very well regarded Practically every prominent importer handles Amencan goods 80 far as the starff in concerned, importers from the United States and other countries pay three per ceal higher duty than those from the Britain Empire Most of South Affect's diamends and in reach the United States through London and Sungapore Direct steamnible lines between Amencan and South Affects would not only keep for us the larger share of business and the state of the s

gained during the war, but would extend it materially

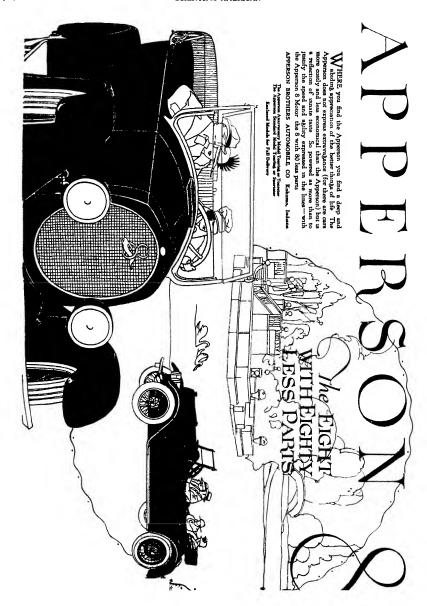
Importers in South Africa have ex persenced much difficulty in clearing goods arriving at their ports on vessels sailing direct from New York, because the bills direct from New York, Decause the cuis-of lading are usually sent by way of Eng-land. This disadvantage may be under-stood when it is realised that cargo steamers, stood when it is reasised that cargo atcamers, sailing direct, generally complete the voyage in about 30 days, while letters going by way of England take from 40 to 50 days This means that the documents reach Houth Africa until 15 or 20 days after the goods have arrived by a direct route. The importer may obtain possession of his goods by executing a bond for the production of the bill of lading within a reasonable time, provided that duplicate invoices, properly itemized and containing the required customs declara-tions, are forwarded on the steamer taking the shipment. If this is not done, the South African authorities assess the goods according to their judgment

All-American agents are needed for hand-ing our trade in South Africa. One American manufacturer who introduced his products

manufacturer who introduced ha produced increasefully through an experienced temperature and conducted an extensive adjections examinate paging narranged on exclusive access with a Fiftigle firm handling one or two other American films and tant or a doesn British articles. Sales were established for a mantha, but after that they fell off steadily. In-quiry disclosed that a British manufacture of the same line had supplement the manufacture of the same line had supplement the form of the agent and gooded the death of the control of the largest and gooded the death of the control of the tangent and gooded the death of the control of the tangent and gooded the death of the control of the tangent and gooded the death of the tangent and gooded the tangent and tangent and the tangent and gooded the tangent and tangent and tangent and tangent and gooded the tangent and 


Our urban customers in South Africa-Risalk Street, Johannesburg

competition difficult. One of the best selling German competition difficult. One of the best skiling German macks not become, pollous troops, and was extended as a standard one width and one wight (a) including a standard application, modeled effect for lightly pollous and sold with or without place and sold with or without place were virtually and the wind of the contraction of the cont



### The Heavens in May, 1919

The Solar Eclipse of This Month, and What Astronomers Hope to Prove by It

By Professor Henry Norris Russell, Ph.D.

THE present menth is notable for the occurrence of a great college which happens on the 20th and affords the longest view of the surroundings of the sun while its own dik is hidden which has been possible for many

At the time of this celipse the in-n is within a day of periges and unusually near the cartle ber distance being a little less than 2.31 000 mile. In a nequence his tapering shadow is still nearly 150 miles in diameter tapering smalow is sun in art 180 miles in minure, where it roaches the earth's surface and observers statated within the belt ib at \$ 000 miles in length over which this shedow we possible to cover the dark will see a total solu (clipse of minusual durition). which at maximum may amount to six minutes and

The echase track is rather unfortunately situated Beginning in the Pacific Occan just off the coast of Peru beginning in the relate Octain just on the close in Fer-it aways a cross South America traversing the Bolivian mountains the firests of Brizil and the higher lands of the castern coast. Then it crosses the Atlantic, almost along the equator just grazes the southern coast. amous among the equator jost graves die souther a coast
of the great western projection of Africa, passes tem
porarily ut to see again and crosses the main part
of the dark continent by way of the Congo basin and
lake langanyika—finally knowing the
searth's surface at a point in the Indian
Ocean not far from the African coast

The region within which a partial colipse is visible extends far northward and southward including practically all of South America except the extreme southern tip, and all of Africa except the Methterranes coast. The region where totality is longest lies in the Atlantic, and the maximum duration of culpses observable from land stations is about four influtes, with is reached on the cast coast of South America. and the west coast of Africa. There is to be sure, one small island in the Atlantic, lying almost in the central line of totality where the cclipse lasts fully six minutes, but as this spot known as St Paul's Rocks, consists of a few jagged rocks rising to a beight of 60 feet from deep water, with no anchorage and no from water, it is hardly an inviting station for even the hardiest astronomer in spite of the fact that certain optimistic souls have nominated it as a way station for transatlantic airplane flights

The chimatic conditions along most of the track are unfavorable—the best chances the track are uninvocable—the best chances
of fine weather being on the high lands
back of the eastern coast of Brazil and in
central Africa above Tanganyika On
account of the remoteness of these stations, and of the disorganization resulting from the war few expeditions appear to be projected to view the celips. One English and one or two American parties however, are likely to make the journey

It is to be regretted that the chances for observation are not more numerous for this eclipse is of very considerable scientific

this ethies is of very considerable scenam.
Importance The usual observations of
the 'flash spectrum at the moment when the sun's
atmosphere is being hidden behind the advancing edge
of the moon, ar coming out again on the other side can
be made. The long totality affords an exceptionally chame for observations of the corona and photographs of the sportrum. But the observations of greatest interest which are possible at this time deal with quite another matter and one which is exciting a very lively interest imong physicists is well as astronomers at the present time

### Motion or Relative Motion ?

Let many years physicists have hoped and sought to device one means of measuring directly the earth's motion through the other who hemisters the vibrations and the mergy of light. Successive experiments of and the negs of hight. Su cossive experiments of increasing in control and delicies, have all failed to detect any set off of though in some cases it should have been vive eight to the meaning in the though the some failure left the little of the now fumous theory of Relativity a sile tire too extensive and intrinsit to go into hore furth r than to so, that its find uncertail assumption is that Nature is of such a character that it is impossible to detect that my body it syst in if bodie as in uniform rectifinear motion by any physical experi-

ment whatever unless there is some other body outside the system in which case the relative motion of the two, and that alone is observable

Viemirkable extension of this theory has been made A rimitable extension of this thiory has been made by the physical Function—Swise be light but long results in Germany who has it to upded to include results in Germany who has it to upded to include rations. He work as introducely outdownstrial and ex-trainty difficult but certain consequences of his thory are rasky comprehensions plant if there were no other planet to perturb it would not remain ab-on other planet to perturb it would not remain ab-

solutely fixed in position, but its longer axis would slowly solutely used in position and in the more assessment of the same at a rate why he can be calculated from a matern as theory. When applied to the actual planets this theory gives results a small to measure, except in the case of Mercury, but here it accounts for a large distributed between observation and previous gravitational theory, which had been known and had gravit (100mit 100my, where mad to it amove and one purzaled actronumera for many to use very to the point of leading some of them to postulate to ad littonal planet vulcen made Mercury's orbit. Not uncrely thus, but of accounts for these effects quantitatively, the calculated and observed effects agreeing almost absolutely. deflected by nearly two seconds of aro, while for rays passing at a greater distance, the deviation should be in-versely proportional to their distance from the sun'scenter

versely proportunated four distance from the sun security. It is then easy to see that a star which we saw by light which had almost grazed the sun should appear to us to be shifted away from the sun's center, by the amount just stated. But we can only observe stars close to the sun at the time of a total eclusee, and one star alone will not do We must have several an different sides of the sun and some nearer than others so that they appear to be shifted in different directions and by different amounts be shitted in different directions and by different amounts. Then, by photographing them during totality and measuring the photographs, it should be possible to determine whether their apparent positions, relative to one another, have been altered as the theory domands.

The present eclipse is remarkably favorable for this investigation, not only because of its long duration, but still more because the eclipsed sun happens to be right among the star cluster of the Hyades, with numerous and excellent reference stars on all sides of it. An at-tempt will be made to get photographs suitable for exact measurement with instruments of long focus, and if only the weather is favorable, it nught to be possible to settle this important question once for all



NIGHT SEV. MAY AND HINE

This is a strong argument in favor of Lilistoin's theory. But secondly, his theory also predicts that light originating in the sun, where the gravitational attraction is very strong, should have a slightly longer wavelength than light emitted by a similar atom on the earththings happening as though the powerful solar gravitation slowed up the luminous vibrati in by a minute amount Very careful measures by De St John of the Mount Wilson Observatory show apparently beyond ques-tion that no such effect is present. So we are left again in une reainty

### The Sun and the Light from a Star

This is where the eclipse observations come in, for I matern a theory products that a ray of light, passing close to a great gravitating mass like the sun, should be slightly bont inward as though the sun attracted the light and deviated it from its rectilinear I has as in many ways the most remark able of the

cours quences of the theory but to determine by ob-sets thou whether it actually happens is not easy. The sun is the only attracting body within our range which is big enough to produce a perceptible effect. A ray of legit which almost grazed its surface would be

### The Heavens

At our time for star-gazing, which is an liour later than through the winter, to allow for "Daylight Saving," we find Arcturus high in the south and almost on the ineridian Below him, and to the on the meridian Below him, and to the right is Spies, while farther down and to the left is Antares, with the head of Scorpio above, and its tail dragging down to the horizon Low on the southern horizon is a part of Centaurus. The two brightest stars of this constellation are invisible in our latitude, but at this time observers as far south as the Floridan peninsula may see them low in the south Alpha Centauri, the easternmost of the two, is the brighter, and the line of the pair punts toward the Southern Cross Returning to our own skies, we find

Hydra stretched along the horison from south to west, with Corvus above, then Leo well up in the west, with Gemini setting in the northwest. The Great Boar is high above the pole, and so are the Isttle Bear and the Dragon, while Cassio-pers and Cepheus are low in the north Cygnus and Aquila are low in the northeast and east Lyra, Hercules and Corona are above them, and Ophuchus and Serpens fill the southeastern sky

### The Planets

Mercury is a morning star this month, and is well visible at its beginning, as he reaches his greatest elongation from the san on the 6th. Shortly ster that date he rises at 4 A M (by the clock) and should be easily seen in the dawn. He is in Pisces, and much brighter than any fixed star in the vicinity.

Vottus is an ovening star, and exceedingly conspicuous, heing very far north, and remaining in sight until well after 11 P M She is in conjunction with the moon on the 2d, being about three degrees north of her and this will be a very lavorable time to pick the planet up with the naked eye in broad daylight Mars is in conjunction with the Sun on the 9th, and is

invisible

invisible
Jupiter is an evening star, and is not far from Venus,
higher in the sky before the 25th, and lower after
Saturn is in quadrature cast of the Sun on the 13th,
and crosses the meridian at 7 P M by clock time

Uranus is on the opposits side of the heavens and is in western quadrature on the 23d, so that he is observable before sunrise.

Neptune is an evening star, observable. only just before dark

The moon m in her first quarter at 8 P. M. on the 6th, full at 10 P M on the 14th, in her last quarter at 6 P M on the 22th and new at 9 A M on the 29th—the P M on the 22th and new at 9 A M on the 29th—the day of the great eclapse She is nearest the earth on the 28th, and farthest away on the 13th While she travels around the heavens, she comes into continuous with Venna on the 2d, Jupiter on the 4th, Saturn on the 7th, Uranus on the 24th, Majority on the 28th, and Majority on the 28th. LEGAL NOTICES

### PATENTS

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### COMMISSION BUSINESS





### The Current Supplement

PASTEUR originated an idea, about which furious controversy has ever since raged—the idea that there exist beneficent or physiologic micro-organisms, in addition to the pathogenic ones, and that the services of these little guests are vital to certain of the life processes of the host. Another controversy of recent years seemingly with no bearing upon this onnescence Now comes Professor Pieran toni, of the University of Naples with the claim that the two subjects coalesce—that m showing the light giving powers of certain animals to be due to micro-organisms in showing the light giving powers of certain animals to be due to inner-organisms harbored by them he has at the same time proved Pastein a case. His account of his investigations is translated for this work is Superprise. Yo 2281, dated May 34, under the title named I numericace and Symboles Microbes Many other articles of interest will be found in this issue. Important for the cryonical fundamental of industrial or Inportant for the exponent of industrial science is Manganese Alloys in Open-Hearth Steel Practice which gives the results of a comprehensive investigation of this sub comprehensive investigation of this sub-ject by the Buicau of Mines. Under the head of laboratory seence may be men-tioned High Vacua and Their Measure-ment while the man who follows science ment while the man who lollows science to receive a sole sake will be interested in Fundamental Concepts of Physics, which gives an account of an fort to effect for this subject the same picess formulation that Bertrand Russell and others have brought about in mathematics. A com-prehensive account is given of an important agricultural industry of the Philip pines in The Coconut Palm The article on Radio Telephony is concluded, with a number of very attractive photographs of airplant and naval apparatus developed during the war from a breach con-temporary is abstracted a discussion of Animal and Vegetable Rennets, a subject of more industrial consequence than the average citizen realizes | There are several good pictures with accompanying text, upon Our Lequid Fied Among the shorter articles of interest The Homing Habit of the Pulmonate Mollink Oncidium deserves mention

### Our Largest Newspaper Prosses

(Continued from pag 451)

machine in each section consist of two parts of 16 pages each If desired, however the web after being shi in two can be carried over to a single folder so that a 32-page section will result | The method of folding the paper is clearly shown in the illustration 1 inst the web is carried over a form erosawise cut and dropped on a traveling conveyor. A special counting mechanism pushes every lifticth paper a little further out so that an accurate count of the num ber of papers may be had

When it is desired to use more than one col ir the bottom web may be carried up through the cylinders above it and they may be inked with color. In fact, a single web might be run through all of the cylinders of the section receiving eight differen color impressions. When printing several colors and when printing fin half-tone work it is necessary to prevent offset of color on the impressions rolls and transfer of the solur back upon the p per This is prevented by the use of a sil of thin offset paper shown on the let hand side of our illustration. It will be understood that the second web from the ground is no running and that the bottom web is running through the second row of cylir lers to take on extra colors then the offset paper runs on CATA colors then the offset paper runs around the second impression cylinder just beyond the first plate cylinder and as rolled up again on a take-up roll which may be seen behind the larg roll in the illustration

In a large machine of this character, the main problem is to supply the press with paper. The cylinders govolve at about 360 revolutions per mineta, which means that the paper travels at the rate of nearly



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Stops creambling, cracking and freezing of brick, cement and opacrete. Scale in deep and waterproofs. Covers and generate stains. Colors side walls to match facing brids. Brishes or opage on in any semperature on dry parface. For factoring from distribute, see. Non-factor coors-affanaged-links Red, Dark Brick Red, Standard Brick Brown, Black and Uncolored.

REBLY COMPANY, Indianapolis, Inc

## Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

## Electric Shovel for Underground Mining

A' electro show I designed to in the ground mining I was Ohi mining I was Ohi mining as a departure from the shoulder I thin rich swing type of stream should as construction adopting it to the introne. prentiar to undergrant prettia. Be sites being d sign 1 1 1 1 1 10 m restricted space at its 8 1 1 ft (1 t it an be quickly dismant) 1 1 1 1 issuing on be query standing to prove through narrow later in Figure 2 was the hosting or viny so so in the polling movements protoff to the man are all controlled for them is single methal speed type of motor equipped with first no control. The shovel relations controlled with the ton control. ing through a complete cir le has the advantage of being able to work in any direction and to load cars quickly at the

Cost figures supply 1 by a northwestern aron company covering a period of laurand a half years show a saving for the shovel over hand later. The ore loaded was 25 per cent fine and 75 per cent lump the largest pieces being 2 feet 1 v 2 feet 1 v 18 inches the output 150 t 220 tons daily

Power curves for one of these she vels equipped with a 20 herse pawer motor taken while loading five his cultive ears of iron ore show an average of 16 % have power. Operating in an iron name in Ni w York over a period of nine menths the shovel loaded 37 208 time of ore into 13 022 cars the cost figures unnounced comprise \$1 824 for 1d a \$1 255 for supplies and \$122 32 for power. This includes the expense of loading and tramming the ore about 400 feet a expense of moving the sh vel to different locations and it brings the average gross cost per ton down to 16 6 cents as against 30 conts under the sime conditions by hand labor. The net saving fr nine months was \$5 000.

#### A Housing Propeller for Small Boats

FROM Canada comes the ingenious two illustrations. I veryone who has handled motor craft in shallow waters patticularly in waters infested with sea wood grass and reeds knows what trouble may be caused by these obstructions becoming entangled in the propeller. Also where a landing has to be made in shoal water er over but im that is covered with be ulders the possibility

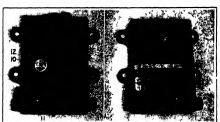
of the propeller striking bottom is the ouse of mach



The electric shovel that reduces underground mining costs

anxiety the lorouto people who have brought out this device have made the prop fler self protecting. This has been due by inserting a universal joint in the propeller shaft and building within the the shaft and propeller are automatically

and at its outer end is divided into two arms in of which supports the outer bearing of the propeller shaft, while the other curves downwardly to a sufficient dipit to act as a shilld or guard to the prop if r blades. The propeller can be raised a lowered by a hand lever which



Exterior and interior view of the interrupter for airplane engines

hit I on striking bottom, in passing over a sand bar or rok or in running the boat ashore on some sloping beach. The engine and the propiller housing are prictically installed so as to bring the cuttre weight amidships, and within this housing is placed a highed proceeding skeg while prices have been seen as the control of the housing the prices are the top of the housing lifte I on striking bottom, in passing over

engages a ratchet, but in case of striking an obstruction the ratchet is so adjusted that the propeller will be automatically lifted to a sufficient distance to clear the object | he housing is built water-proof and is provided with place held in place by thumb-serews which can be removed for inspection when it is so desired

## Stopping the Engine Automatically When the Propeller Breaks

When the Propeller Breaks

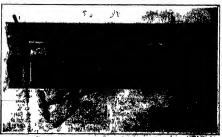
Until recently the breaking of an arphane propeller while in full flight has always been accompanied by more content of the property of a tractor plane, in the event of its propeller breaking, is to go into a tail stall. Index such conditions either type of machines the plane to go into a tail stall. Index such conditions either type of machine is apt to pass lake a spin as a result of the unbroken blade tending to white the propeller property of the propeller property of the propeller property of the property swing the machine around a neutral, or pivot, point between the center of pres-aure of the unbroken blade and the center aure of the unbroken blade and the coun-of torque. Other factors may increase or lessen this influence, and the engine may or may not go overboard as a result of the unbalanced torque reaction.

The resulting intense vibration is apt The resulting intense vibration is apt to break a gasoline line, and, conse-quent upon the continuance of the flame of combustion exhausting into the gaso-line-charged atmosphere, be followed by inner-larged atmosphere, be followed by fire Sometimes the most perfect mental and physical coordination on the part of the piot fail to prevent than a since the brain and hand can seldom set queen enough as many thoroughly understood accritonts of this nature attest. This manual initiation will be better railised when we consult that the time stateval per revolution for infrance anguste, asper revolution for airplane cagines, as-naming full friendle, vanies from one twenty-thrid to une twenty-seventh of a second . Iven under peace conditions some of our best polots have been inable to prevent fail crashes following such inchaps: This is partitularly true at the prevent time with the high powered origines, high engine speech four-bladed prepolers, and the general land stresses employed

employed
Under the auspress of the National
Advasory Committee for Aeronauties
and with every facility offered by the
Navy and Army air stations, Theodore
Douglas of Beocklyn, N Y, has developed an ingenious interrupter which
automatically interrupts the engine ignition, thereby stopping the power development of the engine, in the event of
the propeller breaking, or other similar
breakage resulting in a serously unbalanced condition of the power plant
The interrupter, which is depicted in
(Continued on page 474)



Housing propeller raised for inspection or repairs







INVENTORS Give us only you ridees we will deve on them we are appertuned and developing inventional policy and developing inventional Designation and building special labor awing machinery a specially Elik Mfg. Co., 1926 Broadway, New York

SOLVINI BOILIR PRISERVER

Watershoel, With and seale formation prevant spitting and seale formation and seale formation with the seale formation of the seale forma

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## Manuscripts of Scientific and Technical Books Will Be Considered for Publication

The Book Publishing Digart meant of the SCHENTIEL AMERICAN will be glad to give a painstaking and cour teous examination of any man unoripit of a scientific or technical nature which authors may be resembed in their carriers with or the manuscript reay be submitted with an analysis and as matthic There was never a better than the submitted of the manuscript reay be submitted with an analysis and as match fillustrative material as a match fillustrative material as a match of the submitted for a book, and the submitted for a book and the submitted for an analysis and the submitted for a book and the submitted for a submitte

THE AMERICAN

#### Our Largest Newspaper Presses (Continued from page 46")

14 miles per hour. In a quarter of an hour a time the big paper rolls are entirely consumed. Just before this happens the press must be stopped and paper from new rolls pasted to the ends of the webs and then the press is rus slowly until the pasted joints have passed through One hundred and eight miles of paper 6 feet wide an used each hou. Ilhs quantity of paper.

weight about 18 tons.
The cappeity of the press is 400 000 oight-page papers per hur or 75 000 12 page papers per hur When running the machine as a c. dir jures, it well print 50 009 14 page papers per hur with the two outside pages printed in three colors and black. The machine is 48 feet long and 10½ feet high weighing altogether 130 0000 pumils. A better effect of its Page comparing the machine with the operators in the forceroing the forceroing the machine with the operators in the forceroing.

#### America's Optical Emancipation

(Continued from page 455)

an approciable amount of lead oxide is called a fint glass without such amount of that oxide it is a crown glass. The different types and varicuss of glass have different refractive indices and relative dispersions and are made to serve different optical requirements.

When the pot a filled with the ingredients the mass speedily becomes liquid in most cases assuming the consistency of their key rup or glycerin. The temperature of the furnace is maintained until after the glass is ready to be surred. This is determined by proofs taken at as a bouns, first tests in linear candy in the making. The glass is stirred by a mechanical device being accomplished by a clay rod on the cird of a water-cooled tube. During the lister part of the stirring the temperature of the furnace is allowed to fall and the stirring the stirring the temperature of the furnace is allowed to fall and the stirring the stirring the temperature of the furnace is allowed to fall and the stirring 
This stirring pricess is highly important. I post target dip used the elimination of those fatal defects of strain and strain or strings running through the glass of a lower refrix tive under than the cast. The impredients of the mixture are of different specific gravity—the more thoroughly all of the materials are mixed to render the whole mass homogeneous the least the damper of string.

The temperature of the pot of molten glass as accurately determined throughout by means of an optical pyrometer. This instrument contains a small inconfidenced lamp the color of which varies with the intensity of ris heat which tomperature it registers on a dual. The furnace operator looks at the molten imass with the pyrom eter through a small aperture in the furnace door. When the color of the incondiscent inlament exactly matches the color of the glass he reads the supprature.

Cool of the guass needs to be finished the furnace door is lifted and five or ax workmen transling a long p-table crase into position pick up the white-holf pot and transfer it to a cooling urasee, and another pot previously heat of takes its place in the melting furnace. The entire process of melting and strr ng has consumed from 24 to 48 hours and the gradual

and the melting informed. The entire process of melting and string has coosumed from 24 to 48 hours as I the gradual cooling takes froe rax days longer. The pot is then taken from the cooling france and broken up. The resulting chunks of glass are examined, and shows the string of the defect of the cooling france and broken up. The resulting chunks of glass are examined, and those showing string of the three policy of the cooling france and the second process of the cooling france and the cooling f



## Efficiency Products Company



bale ites facts and be provided with a part of the par



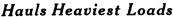


For Gunsmiths, Tool Makers, Experimental & Repair Work, etc.



from 9 in 10 18 in swing Arranged for Steam or Foot Power Velocipede or Stand up Treadle

W F & J Barnes Co Established 1872 1999 Ruby Street



Tun is inoney with a motor truck. Safeguard against delay with Powkariza. Tax causes Made of for one of the control of the con

8 80 cast of Rock es

Powirstell A Towlock, a safeguard
against stealing fearers are tire, has
strong lock that can be picked. At
dealers, \$7 35 can of Rockies.

BRODERICK & BASCOM ROPE COMPANY
SAINT LOUIS NEW YORK

Manufacturer of Calabrated To low bridged
Wire Rope-Holped in building Penama Lanal 49

POWERSTEEL TRUCKLINE

35-

## Recently Patented Inventions

Brief Descriptions of Recently Patented Mechanical and Electrical Devices, Tools, Farm Implements, Etc.

position FOR DUMIN MERIAL BOMBS.
E. V. Beaners: Since Indiding New York
N. Y. The Investign of Indiding New York
N. The Investign of Indiding New York
In modif for furnishing duminy acidal bumbs of iteration and the treaty causing coincide the case of the abolt and the roby causing coincide the case of the abolt and the roby causing coincide the case of the abolt and the roby causing coincide the case of the abolt and the roby causing coincide the case of possible for the roby of possible formed of or fat of leve of the abolt and the roby causing coincide the case of possible formed possible for the case of possible formed possible for the case of the case of the abolt and the roby causing case of the case of the abolt and the roby causing case of the case of the abolt and the roby causing case of the case of the abolt and the roby causing case of the abolt and the roby case

object of the invention is to provide a deflector which may be used in count crow with electric fasse of various types wherely the direct breezes created by the fast may be broken up and dis-ributed the result being that a greaty area is couled by broken or in thest als courants.

FLANHIIGHT II M KORTEKS care of Bright Bias Datters Co. 110 Hudson St. New York N.Y. The general object of the invention YOR N Y HE (RECEIVED AND ADDRESS OF THE INVOICED IN THE PROPERTY OF THE PROPER circuit continuously or intermittently

SUPPOBLER FOR FIGURE (I OHE SHADES -O L SHAFAR and I ARNOW 140 (Jacomont Ave. Now York N. Y. Thi object of the invention is to insure the service position of a defusing shade suspended below an electric globe and to maintain the series relation of the shape of the globe. The invention comprises a plurality of bracing collars reach base vertically connecting the collars a contractible hoop and separated bracket arms onus ting the hoop and

WELDING ELECTHODE B W. Brwgs its Ligamore 4t Faston Pa. The invention dates to carbon its trode holders for electric are reasons to chrom its trues notices to provide a con-struction of devices of this character so designed that the operator can handle the helder with mor-comfort and safety, the abled and handle being so constructed as to reduce heating to a minimum

STUMP PULLER — I I MONK Thums ville Ga The invention relates to linear machine traveling on the surface and including a drum. Fire object is to produce a stump puller by means of which the power or draft by a



A FRONT KURNATION OF THE MACRINE AT W tractor or team is convicted into opward pull so that the stump is lifted out of the ground and carried forward. A further object is to provide means whereby its machine can be drawn from page to place without necessarily turning its

RAY 465 2d St. Niagara Falls N. Y. The in-vention relates generally to corn husking implevided with a busking book a pad disposed against vided with a massage more a pack defenses ascense one side of the familie a strap having one end saws lated with the pad said pad having openings to receive pertions of the wire loop the strap having openings for the receipt on of the extension of the handle carrying the husking hook

#### 01 General Interest

FIX TRAPS I M Were just 11th 8t affport Miss. The object of the invention is to provide a line consisting of inner and outer panels formed from a single sheet of perforate material unnets the common wire its access con-bent upon Itself. The trap body consists of two estantially conical members arranged in spaced ation one within the other A mitable base is

and by mean of pressure forced evaluation and the second of the second o sate but comprising a server section a filter setting the but comprising a server section a filter server section of the server and life in server and life in marrial hold on the screen CARD INDEX I R (ARROIT Norfolk Conn I'he helper to fith invention is to provide a card index scranged to resider visible the names titles and other legends on record cards ledge leaves and other printed or written sheets withou



A TERMINITURE 1724 requiring separating or fingering the

Another object is to provide a sectional support for the card carries the sections being de-tachably connected with each other 1 15K BOPTPR—V BYRKOFF (are of Mrs. P. HOFT, 1498, 111K BOPTPR—V BYRKOFF (are of Mrs. P. HOFT, 1498, 111K Ave. Mount Vernon, N. Y. Armong the object to of the invention are to provide simple means for forming regular dolled or broken drawn lines to provide an Duple ment for assigting in the operation of traveling broken lines composed. of marks of various lengths to provide a device wherein provision is made for a variety of lines of standard characterization and to provide an

A9H SIFTER J CARROLL 65 Third Place Brooklyn N Y The invention has for its object the provision of a construction whereby ashes one pervisant or a romaniscom wascept same may be affed properly and the usual dust or loos when a paraticle by the affeling operation confined and caused to active in a mittable reverptacle with-out the same of the confined and the same The deriv comprises a boosting and a wire case more properly of the same of the same quietle affect to the same forth movements for quietle affect, the same forth movements for quietle affect, the same confined as a same properly of the same properly and the same properly affect to the same properly affect to the same quietle affect qui

quickly affine the asther
VISHEP PAPER PAEDER AND CUTTER
—W N Lay Hoy 1778 appelane Wash The
howeline has for to object to previous a visible
howeline has for it to object to previous a visible
paper for any desired juryon. the foeler hasting
an optimic through it to open white primits the new
to examine the paper where held by the foeder
and which has affined accorn to the paper teasifies
nomine a hold the paper at the feeler when the
pairs its would the feeler is int

paper to some the restre is cut
AN HBI IPPING DEVICE —R R COTTEE

859 91 Johns Place Brooklyn N Y The
Institution relates to foot wear An object is to
provide a simple and efficient contributors which
can be easily and quickly secured to a shoe and can be cashy and quickly secured to a since and when so we need will prevent slipping yet will not render walking un omfortable. The derive com-prises an ankle sirap a pair of toe straps and chain sections assess lated with the toe and ankle straps

sections assess tasted with the toe and anche strape COLI ANAISBLE PAPPR HOLDER — J B FALLEN HOLDER — J B FALLEN ORGEN STREET FOR THE STREET

provided for supporting the lass, and for supporting the lass, and for supporting the last container.

### REGG PRESERVER—

| O Planting St. | Chapter | D P

needs and promote the use of an article ordinarily used as a collar and made principally of wood whereby to conserve both metal and leather of which ordinary collars are manufactured

which ordinary collars are manufactured CC PF LIANK, G P C axon 201 W (artisle Are alpokane Wash. I he invention has for its with the collars of the collars of the collars. I have seen to be collars of the collars of the collars of the eight buttonhoise fedding and coff to the wrist-band of the shift in each manufer that the cuff may be used as link cuff reversible after one COULING. OB. COOKING, BOX.—A. Buarvan Schweningen Netherlands: The in-ventia is based upon the fact that vacuum pero-vides for the bost insulation it relates to a cooling and cooking how where the the insulation is to do.

and cooking how where the measures so calmed by a vacuum inclosing a chamber for receiving food or drink and wherein the vacuum is maintained by a water drives nection pump this pump being connected with the water supply plpt. It certy required for wax-mating the air from it; haulating space is practically obtained. for nothing

UMBRELLATOUT—HILL OF SERVICES OF Broadway, New York N. Y. Ho Invention rolates t an attachment for umbrellas cames and the like the object being to provide a construction which may be used as a toop for supporting an article to which its secured on the wrist or by the hand in an easy manner. A further object is the provision of a band with a loop field adjustably against one side of an article for clamping the loop so as 1 straddle the article

mo as i studdle the article

BIRD FFRCH—C W MIRCLER 1009

Roundl Avi Irray City N I Among the
print had close to which the invention has in view

are it privide a perch for birds which may be art is rivide a peen five bride while imay be rown of from service position do his the absence of the birt to provide peer his which may be arranged our above the other and in which abelies are is protection for the bride on the abelies are is protection for the bride on the abelies are is protection for the bride on the abelies are in the protection of the bride on the placeness with as those used in military operations (A bibly 100 DMM). Are protection for

( ) RD HOLDING ATTACHMENT FOR PENCH S—A B 80 off Fairmont W Va The invention relates more particularly to means for bolding an identification card such for example for boilding an identification earl such for example as a lodge and or that of an officer or cellsted man in the Army or Navy although the device may be comployed for use in holding a calendar sheet or the like. The invention in the preferred form is enversible designed for use in pessel cases from its enversible designed for use in pessel cases from its enversible designed for use in pessel cases from its enversible designed for use in pessel cases in the contract of the preferred form and housed within the case.

INCLBATOR ATTACHMENT—G W
DONER Oweola 8 Dak The invention has
reference to means which may be applied to
existing incubators whereby access may be had to the interior of the incubator without affecting for instance when removing batched chicks on when removing ogg abells to prevent injury to chicks to be hatched

chikus to be hatched

MATCH BOX — I BLUMENTHAT 70 E 121st

8t New York N Y An object of the invention
is to provide and enamental match hox in the
form of an sirplant Another object is to prodefe support for the match box with is formed
with compartments for various kinds of matches
and to provide convenient striking membees for
the various matches

the vertons materies

POI (H --) Arm 274 State St Flushing

V The invention relates particularly to a
tobacco pouch made of stiffened material. It is
characterized by the provision of an auxiliary



SHING DISCHARGED

charmed the dayle can be saily handled with one hand when discharging the contents which user be readily controlled. The possen is particularly suitable for hand-saids disabste use.

suitable for hand-mide dignists and.

ATTACHMENT FOR SEAVING BEIGHT

E L ROSSESSON/Elles Club, No. 618, Hanchibe,
Territory of Haundi. The greation has too for

object to provide an attachagess wherein means is provided for engaging the handle of a brush and to secure the said means in place, the means con-sisting of an arm extending transversely of the bristies at their free code for rubbing in the lather as it is applied to the face to sorted the beard

PROCESS AND APPARATUS FOR CRACK-ING AND DISTILLING HYDROCARBONS ING AND DISTILL ING HYDROCARBONS—
A Con man 559 Madison 8t., Brooklyn N. Y
The invention relates to the exacting and distilling
of petrol um and other hydrocarbons for the
production of gascline, benefine, tolumns and the production of gaseline, between clutten and the like, its object is to provider's process and ap-paratus in a very simple manner with less produc-tion of carbon a higher yield, increased production and uniform nature of the resultant gases and

MILK BOTTLE HOLDER —P D ARGELILLO 86 Forsyth St. New York N Y The object of the invention is to provide a construction which may be slidingly fitted onto a door and after the door has been closed be automatically locked against removal until the story is opened. Another object is to provide a holder which automa remains unlocked when an empty bottle is therein, and becomes locked when a full be

placed therein

FOLDING AND GATHERING DEVICE

A LEVET 15 W 70th 8t New York N Y

Thi investion relates to a contribute whereby
suitable materials can be folded and gathered by suitable materials can be folded and gathered by a simple method which does not require a skillini operator and is therefore economical. Another object is to provide a device which is particularly suitable for the manufacture of buffing wheels or circular brushes

SHOE HERI - I HAND Orlando Fis. The SHOE HFRI - I HAND (Plando Pia The particular object of this investion is to provide a cushion beel which will be durable and issting and which will wear overly and uniformly during use look for the purpose of increasing its length of III and preserving generally the same appearance throughout such life The investion is applicable to shoek the both men and women

RCROAL DESK — J J MCMILIAN, 81 Vestra 8t, New York N Y The invention has par-ticular reference to combined desks and seats Among the objects is to provide a suitable support for a clerk that will afford the maximum amount of comfort to the puill with respect to the dis-



position of his feet and legs. Another object is to provide a combined desk and seat with facilities for adjusting the height of either the desk or the seat independently of the other to accommodate the stature of the pupil.

the stature of the pupil
TARRIST-SIORTING DEVICE — A L
Hooses #RF and B His Weshinston, D C
B-0-300 Grd Dept. The investion relates to a
device to be used by infinity men to foositing
rouncy in finition; targets. A specific object is
a clock face or disk with a central peophelic as
a clock face or disk with a central peophelic as
a clock face or disk with a central peophelic as
a clock face or disk with a central peophelic as
a clock face or each product of the contract specific product of the central peophelic as
a clock face or disk with a central peophelic as
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FINDINGS OF THE CONSTRUCTION — F G JODRAY
FOR THE CONSTRUCTION — I SHARE THE CONSTRUCTION
THE CONSTRUC

## norical Emancipation

(Continued from page 489)

as usable is cut to the size and weight deured and supressed in the pressing furnaces into the approximate form in which it is to be used

The sulminating processes in the manu The summinating processes in the manufacture of glass for ophthalmic lenses are still more spectacular. The pot after being takes from the melting furnace is not allowed to cool but is suspended from an overhead track and hurnedly conveyed to a position above a large iron casting table. On to this table the molten mass table On 50 this table the motten mass is poured in front of the huge iron roller which is set in motion and the glass rolled into a perfectly even flat sheet. This glowing sheet is at once projected

into the annealing oven or traveling lehr' as it is called, where it is slowly ad se it is called, where it is slowly advanced into sones of constantly lowered temperature. The oven is approximately 100 feet long, and the sleet of glass requires about six hours to pass through it the mperature ranging from approximately to room temperature in the process Annealing is the timi process for all optical glass and is very important to its physical usefulness. In that process of gradual cooling under carefully regulated temperatures the molecular strain of the glass is relieved and the liability to breakage in future handling greatly lessened To quote Major Wright in conclusion

'The path leading to high precision is straight and narrow and constant vigilance is required not to deviate from it Optical glass as a thing of high precision

This is another path which American industry has traveled thanks to the am bitions of John J Bausch and the unfaltering determination of his son to see them realised. And now as the father ap-proaches his 90th birthday he beholds what he hardly dared dream of when he started his doubtful venture 66 years ago-America optically freed from the last trace

#### Increasing Visibility Through a Knowledge of Camouflage

which had for its purpose the deceiving of the submarine? The Jones visibility meter is now being utilized in a series of studies which have for their object the working out of schemes of painting which will meure the highest measure of visibility and emphasize the direction in which a vessel for instance may be heading. That is to say, the desire is to determine just what colors will make a ship conspicuous where now her somewhat indistinct appearance may confuse an observer regarding her actual course. The results already obtained show that red and black already obtained show that red and black for example, have marked yearbility, and it is highly likely that these and other colors when laid in a suitable manner upon the aurfaces of a craft will go a long way toward making clear a vessel a line of advance and, to just that extent lessen the hasards of collision The movement of shipping will be further aided by similar improvements in the coloring and marking. or snipping with be further studed by similar improvements in the coloring and marking of navigational guides, such as light-houses, lightships, buova and bescons By parity of reasoning aerial unvigation by parity of reasoning serial invigation and the finding of directional landmarks can likewise be facilitated. The sema-phores and other agnals employed by railroads may be made more possive by the adoption of new color coatings and there are the best of reasons for believing that vehicular traffic in mounded thorough and the ever widening tide of autoad motor trucks will find this

reaction Theology the War (Contact was as 1887) to Business of page 487.

and shell holes, because short rails were always directly in front when needed But to return to the work of M Briton and Major Boissin, who during the earlier part of 1915 were urging the use of cater part of 1915 were urging the use of cate pillar tractors as tank mounts because they appreciated the great tractive effort of such vibrices and their general maneuver ability over all kinds of terrain Casting about for tractor ideas, these inventors con sidered two American agricultural tractors one of which had an excellent platform for the mounting of the tank body, while the other had a better means of propuls on Taking the best of both designs they set the Schneider works on the task of evolving enterpillar tractors suitable for tank eer struction On December 12th, 1915 the struction On Documber 12th, 1915 the I round army lenguages placed as order for 10 caterpillar tractors with the Schnei ir organization which were delivered same four months later. However this number was considered much too small for any was considered much too small for all tank attack destined to overwhelm the enemy on a given length of front at I steps were taken by the inventors to in terest the French high command which up to that time had been most hostile to new ideas | Lxperiments were conducted during December 1915 with caterpillar tractors over the recunquered battlefield of Sousin in Champagne in order to con vince the military men that these vehicles vince the mittery men that these ventices, the could operate over rough terrain 'till the military men were unconvinced. They admitted the shility of the tank t cross all obstacles but pointed out its vulnerability to artillery here.

It was then that Colond Estienne, wh

has long since been made a general in direct charge of all French tank forces became interested in the possibilities of the tank idea. He advocated the construction of a large number of tanks, and through his persistent efforts he finally obtained the necessary authorization from the French high command From 10 the number of tanks on order at the Schneider-Creus establishment, was increased to 400. In order to check up their plans, the French took two American Holt tractors and with took two American Holt tractors and with their components constructed a single large tractor suitable for tank purposes, all in the short span of two weeks During March, 1918 this improved tank peaced through the most rigid tasts without difficulty and was the cause of the French government placing another order with the Start E-bound removation for war. government piacing another order with the Saint-Chamond organisation for many more tanks. The details of both the Schneider and Saint-Chamond tanks are too well known from previous descriptions to require further comment here
All the while the French kept the British

authorities informed the latter going ahead with their own tank experiments in external appearance the British tanks are different from the French, the pro-pulsion and general details are quite similar At any rate because of their rapid manu facturing processes the British were ready racturing processes the British were ready to employ their tanks in September, 1916 during the battle of the Somme while the I runh Creusot tanks were just beginning to come out of the works In fact, it has been pointed out that our British Allics were somewhat too hasty with the releasing of some 40 tanks which they then had ready and if they had waited until the French also were ready the combined attack might have had a more important effect on the surprised (sermans. As it was, the Germans quickly recovered from s tank defense which es to be heavily when the French opened up with their tank attacks during April, 1917 Indeed, the first employment of the

French tanks in the gr at battle of the a failure, because tank action were little understood M Breton called the atten ar ton of the authorities o the misapplica into of these waspons, and suggested their use as a means of surprising the enemy though the user as a means of surprising the enemy through the user as a mean of surprising the enemy through the user and the

Franklin credited his success in life to the habit of thrift

W S S are teaching extravagant America this habit and

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has put into its hands the thriftiest writing tool ever produced

It saves time by eliminating the con-stant interruptions of dipping. It leasts for years. The pibs do not have to be replaced every little while because of corrosion or loss of temper.

It puts an end to the extravagance of an ink well in which over half the ink is frequently wasted through evaporation or by becoming thick with dust. This

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Williar s Superior quality is no did hossi tut a guarantee to you of the hose material wrought by skilled workmen and rigidly inspected for the slightee imperfection. Dependable tools mean greater and better output with less expense to make and we we been making drop forged into Day for nearly on make a nod we we heen making drop forged into Day for nearly half a century

Bent and Straight Tail patterns sixteen sizes - x to 6 Inches capa see For extra heavy service they are made with two screws cities

Write for pur Machinuta Tools Bookles

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Western Ofice and Warchouse 28 S Clinton Street Chicago, Illinois

28 Richards Street Brooklyn New York

RECENTLY PATENTED INVENTIONS | relates to a keromene or other hydrocarbs natinued from page 470:

## Of General Interest

FISHIND JACKIE DRAICK-W P Daring P O llox 12 Derry N H. The in vention has for its general object to provide a device which can be used as an automatic release for the sinker or weight when the flah makes a



PORITION AND RIVERS ATTACKED

the book leader flux or red from Injuring or weight or sloker is used the spinner when no weight or sloker is used the spinner having a regular rotary motion and a signar movement DRY DOCK -W F Honoro 74 Bedford

Are Herskin N M the invention relations are properly in the pr

LAMP BRACKET R 1 Franciscs Routhville Mich The invention base for his oldest to provide a backet rapidite of virtical lateral or radial adjustment it comprises an i lateral or radial adjustment it compulses and a shaped har of irentar irross section an adjustable cultar engaging each in miser of the bar a sec-tional riamp ronnected with one of the cultars for ringaging a fixed support, and a plate for monorting the lamp

EXPANSION SOCKELOR PLLG D. F. RAYANNION SOLECTION 20 12 (C. 1) by Demotor and IT A Romers 210 W 1 5d St. New York N X Amount the objects of the invention is to provide an explanation socket or plug which may be resultly placed in position for securely anchoring serves no bolts in place in holies drilled in the wall of a building or other structure. Another object is to prevent this structure. Another object is to prevent the socket from shifting or passing too far into or entirely through the look in the structure.

NUI 10t K -k M keeps Atwater Ohlo The object of the investion is to provide a device especially adapted for use in locking nuts on rail joints or other situations where a series of



NOTES AND NUT TO SEE

nuts is desired to is locked. The lock comprises a place of resilient metal leaving at its centers laterally offset portion forming between each on of the strip and the laterally offset portion a transverse shoulder to receive a not and to look it from turning

JOINT FOR DRILL BUS AND OTHER PIRPOSES -II HALS Lope Valley Cal PI REPONEN —II Hart's Lips Valley cal. I He invention relative to joints practicularly and vantas, coar for embediescot in tools such as drill bits inthe is and the like although cosmic of a wise use in foreign joints between the sections of a visit one roll with this construction the parts may be row life in exact the land being after a blint if what is forested them.

PORTABLE HAND PLANER -I II BLOOM POICTABLE HAND CLANE — II BLOOD-LOW to know the Fig. 10. Inventous relate to port the power driven hand planers to be used in smoothing exposed surfaces of woods or other structures and also adapted dependent upon the cutter to performing the operations on rough timber or to form a furrow or channel or to prepare the same in deck flooring or the sides of wooden ships reclinions to the operation of cacking the tools only by cried to vary the depth the king the tools only by there is vary in deput thereof and provise n is made for an adjustable to plate with means for simultaneously adjusting the opposite ends the tools are both light and around. Two patents have been granted to the

Meating and Lighting
HYOROCARBON BURNER—G P KITTEL
IS Unlog Place, Union Hill N J The invention

of such type that the liquid fuel supplied thereto is apprized in transit to the jet orifice as that from the orifice a jet of high velocity vapor is discharged and entrains air that mines therewith elis a large list blue flame is produced

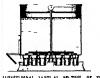
## Machines and Mechanism Davie

CHINDER FLAT-FORM PHINTING MA CHINE WINKIER BOTH Switzerland (111) F. W. INGLER BORN. SWITEMPAIR. The increasing relates to cytinder-lind-from print-ing mass tobs a time object in the previde for a new arrang own to the parts of the driving mech-anism in the tow of devices to obtain greater and to the object of the printing majorithm and for the in offecting an economy of space, which is of great importants (or printers.

COW MILERER PUMP M E JERNERRO F ichedule Manitolus Care This invention re-lates to a machine for militing rows it has for its general object to simplify the construction and operation of apparatus of this character specific object is to provide a multiple cylinder suction pump the pistons of the pumps being operated by a single lever and the parts of the up being readily taken apa I for cleaning

SIKKS PILIER - ( COPPET TORONS) Nev The object of the invention is to provide a device sciapted for use in connection with drills o device adapted for use in connection with drules of the jack harmore type for preventing the drill bill from dropping out of the machine. The darks comprises a frame harker a pair of spaced plates and a latch plate plyoted between the plates backing a note in for receiving the drill-ate m and for preventing the passage of the collar

CUP FIJING DEVICE I D McOarr 1915 I nion Bank Bidg Pittaburgh Pa. The Invention relates to cup filling devices and has for its object the provision of a simplified stru



re for filling groups of cups simultaneously with an equal amount in each cup. A furthe

MILK BOTTLE CAP MAKING MACHINE P. R. SIMONS I ARE CAP SHAFTEN IN ACTIVITY OF THE INSTANCTION OF HUB-liston and Tide interestion relates to a machine for nuturnal sally printing and cutting out disket or cuttinate sally printing and cutting out disket continuous sally of stock and for automatically society of the control sall of the sall that the cuttinate of the cutting of the control sall of the sall that the cutting of t printed sides will all face the same way for facil tating the packing in tuism or other carriers

ATTACHMENT FOR STEAM COTTON
HAMPERS—W & Surra Scuttand Acck
N C The Invention relates more particularly to
means preventing what is at present known as
water packed cotton and to obviate the dis-



OF INVENTION

advantage incident thereto the prime object being the provisit of means whereby to prevent leakage from the piston cylinder of a steam tramper from passing stot the press box in which the cotton is compressed

SHIFT MECHANISM FOR TYPEWRIT-

platen into its upper position and lock it in this

Prime Movers and Their Accessories INTERNAL COMBUSTION ENGINE INTERNAL COMBITETION ENGINE

O J conex at 1812 Brieffil Are Sensitio Wash
Among the principal object of the invention are
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EMERGENOY VALVE—C WIDMANN 20
18th Hs West New York N J This invention
relates to neity's appliances for factories work,
abops on the life where there is simplyed a
prime mover for various medialness and has partktulas nf cent to means for instantly shutting
off its siran to the engine wheely the conjunoff its siran to the engine wheely the conjuntion off the siran to the engine wheely the conjuntion and the machinery quickly come to read
the the event of an in cleant requiring such control in the event of an accident requiring such control.

INTER'SLL COMBINITION TURBINE

ENGINE — P Lono 366 20th 81 Brooklyn

N A monog the print had obleve which the
invention less in twice are to coordinate the
functioning mentions of the engine to avoid
vibration it insure the timing of the weather and
parts taked; in the lesspity thereof to simplify
the constraintion and the action of the mercing parts of the engine

#### Reliways and Their Ace

Enliways and Their Accessories

CAR AA11 BOX - J. R. PLEMING 801 Monroe Ave. Scianion Pa. This invention is especially designed for employment in missing carservice. Among the principal objects which the servic. Arong the principal objects which the invention has in view are to provide means for lubricating the moving parts of a roller bearing to provide vinericating system for scaled bearings and to strengthen the bearing construction and lighten the material forming the same

PANNINGPRS 81DE PLATFORM FOR CAICS 11 PALABRA 243 Newkirk Ave Broakin in Palabra 243 Newkirk Ave cross-set circ and has for its graced object to open cross-set circ and has for its graced object to provide a combined protective case and side that form which the passingers can cavel long dudnally of the east without the use of a rimining dudnally of the cau without the use of a rimining board and is at all times protected from accident the case is ing adjustable into protecting relation at oither all to of the car whereby the latter can travel on an ur and down track with the platform

at the dutated

#FINFORIED RAILWAY TIE—(A. A. I where care of Dr. Win (C. Halleck, 122 W. 18th

t. New York: N. Y. I he invention relates to
these of rolling real concrete the object, being to tion or remain for controls to object being to produce a simple and strong the which can be readily placed which can be made at the point where it is to it used and which is provided with reinforcement disposed in such a manner as to prevent the to from crushing beneath the track beneath the track alls and also to prevent cente

Perialalag to Recreation

AMI SYMBYS APPARATUR—W J. MAN

GARE 2884 W. Fields St. Gong Jiand. N. Y.

The object of the invention is to perovide an

amuse man tap as vita design of to use in pleasure

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motor to a compliable the result us is much of a

work a visible mounted to travel on the track. track a vehicle mounted to travel on the tra-propoliting means for propositing the vehicle a rocking means for rocking the body of the vehicle in the direction in which it travels over the track

GAMF —E FLAGO 100 Broad St New fork N 1 The invention relates to a war York N 1 The invention routes to a war-game in which the opinement as op provided with identical sets of pleves representing an army consisting of infants; a variety and artillery. The game is played on a checker-board the object being to bring a casson to the back row of the enemy a side and maintain it there during a

single innvo

TOY —V E Fravaran Formey Texas This
invention relates to toys having movable
figures wherein a low is provided having thereon
two figures wherein a low is provided that sing thereon
two figures one of which is hinged to take an
updation recluding position and the other having
a movable member spring operated to strike and
knowled form the first named figures and wherein
relevants means is provided for restraining the
question of the spring member.

## Pertaining to Vehicles

GEAR SHIPTING DEVICE—G Q SEA-MAR. 161 Monshmalfs Herseltyn N Y The, object of the Invigition is to provide a semi-shifting device arriangle technic, also become by-power devived front file begins that the become by-the operator of the limits have been been be-

of the investion is to provide a device for moving order to accomplish that regult, can is made of a the piston of a typewiter into its upper position power driven mechanical means adapted to prompting the Nays texted at the left and suggested the shifting forces if a change unset right sides of the keyboard and to provide a pearing to automatically addit from low to high locking law yelds when depressed will shift the specific provided the second of the contraction of the contractio

SPEED CHANGING TRANSMISSION SPEED ORANGING TRANSMIRMON MECHANISM AND BRAKE—8 V. DICERRAN, Shavertown N Y The investion relates to a power transmission speed chaseign mechanism and brake divice especially adapted for use in automobilies airplanes and other power driven vehicles it has for its general objects to transmit-power from a motor or diving shaft to a driven shaft without appreciable loss, and to permit the operator to readily vary the speed of the driven shaft to any desired degree without changing that of the motor

that of the motor TRUCK — J C HICKAY and O J CAPPRILE, 4344 LAWYE N. New Orleans, La. This invention has for take object to provide mechanism for use in connection with the usual freight truck, ether hand or motor operated for depositing and stacking the load automatically. With the invention the mecossity for handling grain in begs or pack aged stuff, respectedly in unloading is eliminated.

RECTIFIER FOR AUTOMOBILE GENER-RECTIFIER FOR AUTOMOBILE GENERATORS—I. A Trevous Paurille, ill The invention relates more particularly to rectifiers for the current recorated by the Food magneto An object is to provide a simple device which may be secured to the creans case of the engine and which will rectify the alternating current or a portion thereof as that a storage lattery may be charged when the engine is running.

when the engine is running
RADIATOR—F W KERGAN, 189 E 86th
81 New York N Y The invention relates to a
radiator for use on automobiles and more partirularly to a radiator in which corregated water
turbe and intervening corrupted radiating elemonts jointly form a serbe of air cells transveneto the general direction of the water tubes

CHAIN AND OTHER ANTIBKIDDING APPLYING DEVICES—E H WRITE 19 Baltimore Si Cumberland Md The Object of this invention is to provide mechanism for use an envention is to provide mechanism for us-in connection with motor vehicles for permitting for chains and other antisiditing devices to be automatically applied to the wheels or removed therefore while the cai is in metion and without the necessity of handling the chain or the wheel

TIRE CARRIFR -1 J Collains and R B Jordan 1407 Avc D Brownwood Texas The object of the invention is to provide a device which may be attached to an automobile to carry an extra tire and which is also provided with mechanisms.



FRONT TIEW OF CARRIER WITH PARTS MHORES

ism for collapsing a split rim, to permit easy plac-ing or removal of the tire. The device comprises a central support a goar ring radial arms mounted to silde on the central support and gripping mechanism for gripping the wheel rim

DESIGN FOR A WRAPPER -M 8 Tsor. DESIGN FOR A SNOW SKATE -- W A.

DESIGN FOR A SHOPPING BAG —E A Finn, 129 Franklin St. Springfield Mass Thi prosumontal design relates to a lady a shopping

We wish to call attention to the fact that we are in a position to render competent services in every bearen of placent or tenders work Comment of the Complex nature of the nature of the comment of the complex nature of the complex n



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## Back to "Cits" Again!

how electric power helped an industry "about face" twice in the same year

To equip and keep an army of four million in clothes was the task set for the textile in dustry. No notice to get ready was given, no time to prepare—just orders to do it and do it quickly

Then, the armistice—from a clear sky the signal to get ready for demobilisation—to get back to making 'cits

Only those close to the men responsible for pro Cuction know how the textue mills passed through these two crises Wires hummed with help us all you can and the quick answer came "count on us to the limit"

Mill power specialists of the General Electric Company jumped off trains in town after town. And G E engineering and manufacturing facilities were placed at the disposal of the mills facing the task During those trying days a G E Specialist was the man of the hour and it is a matter of record that electric power solved many a knotty production problem

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These accomplishments in the textile field are an example of how the General Electric Company serves American industry. Its great manufacturing plants, its corps of engineers, its power specialists—never further away than a few hours inde-are at the service of every manufacturer.

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Special type-sets for every business every language, every profession, every every type may be substituted in a few seconds.

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## The Atlas Slide Rule

all active are provided in the control of the contr GILSON SI IDE RULE CO., Niles, Mich

## HOTEL MARTINIOUE "The House of Taylor" BROADWAY, 32d & 33d STS.

NEW YORK Or Block from Penna Stati n Baggage Trail and Sice I qualty Covering to Amusez cuts Bhopping or Business Directed tran t B way Sulwey and Hule n Tubes Baggago

600 ROOMS 400 BATHS Rates:-From \$2 Per Day

155 PLEASANT ROOMS With Private Bath \$3 Per Day

A Good Food and Reseasable Price

(Continued from page 471) Cambras which was after all the original

purpose of the tank idea.

During the carlier part of 1918 M Renault a Irench automobile engir nonautt in react automobile engineer, began turning out small two-men tanks in large numbers. These tanks were considered more anticed to tank tactice than the larger tanks for after all it is large numbers and small size which counts most. with tinks The B The British followed suit

And then, during the Allied offensives starting with the great counter attack of Init 18th, after the German drives had of the British and French armies came into play With little or no artillery preparaalong the long line without warning His quired them, for that was one of the great advantages of the tanks. His barbed wire and deep trenches counted for little, for the little tanks got over them and set to work with their cannon and machine guns

The German auti-tank defenses failed to stop the Allied tank lleets, there were too many of them even after the enemy had inflicted heavy casualties. Up and down the line, where the Germans had long held superior numbers at hav because of their wire and numerous machine guns, Allied troops came through in over-whelming numbers behind the moving walls of tanks Collapsed German dethe moving walls of tanks compace German de-fenses, retraining arms a disorganized supply lines and futally a more or less complete rout brought the supposedly instituble German army to its knees And from that point on, the story is well

After all the tank and its proper employment proved the one tactic which conquered a powerful and well intrenched Before the tank was introduced, large numbers of attackers fell before the barbed aumbers of attackers fell before the barbea were and intense line of the defenders. Artillery preparation made the attack all the mere difficult by giving warning and by making the termin impassable for supplies tween the interrupter terminals and the supporting artillery. With the The interrupter can be made in two and the supporting artillery With the coming of the tank, however, the harbed wire belt lost its defensive value, and today the advantage again rests with the attacker

## Stopping the Engine Automatically When the Propeller Breaks

(Continued from page 468)

the accompanying illustration, supplements the section of the pilot in such metaners, and through practically instantaneous action interrupts the power development thereby confining the danger to the initial breakings. Such as breaking as seldom seconds in itself. The interrupter is particularly desirable on tamerague machine, as such as norticed happening to one entire would cause the confinement to the disclosure of the confinement to the disclosure to the confinement to the disclosure to th the good engine to tend suddenly to swing the machine around and probably into a spin On such machines the interrupter both engages, thus maintaining an approximately normal flying position The landing with dead engines, or of switching off his damaged engine and continuing off has damaged engine and continuing he flying state that he good engine and reflying string with his good engine and reduced speed in the equipment of 
the binds and other draptible the instrument would find another important 
that we could produce at a sufficiently 
application as it would tend to reduce the 
sectionary date to meet the demands of 
fire risk following propelic breakages, 
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and may be described as consisting at a line or extremely strong and may be described as consisting at a line out extends of the strong and an action of the strong at a lowering on a plane transverse to the internal combesting againsts. Under a to swing on a plane transverse to the internal combesting againsts. Under a saw of rotation of the propeller, By their efforts to develop seeding their actions of the strong and their contractions of the strong

The Invention That Won the War | normal amplane operating conditions, to a very limited are in its plane of move-ment. The amplitude of this movement is determined by the weight of the bar, the intensity and frequency of the transopposing strength of the springs confining it. The extended end of the trigger 3 is constantly pressed toward the floor of the constantly pressed roward use moor to the instrument by the compression spring 4, and is designed to engage the lath 5. On the under said of the trigger 3 there is an inclined surface 6, by which the trigger is rused A ball-pointed hardened steel series is fitted into the bar directly steed site is fitted into the bar directly beneath the trager, and designed to en-gage an inclined surface and thus to lift the trager when the swing of the bar is sufficient. When the tragger is lifted the latch 5 little dueler tension by the spring 7, is released and moves out of engage-ment with the tragger. The cam 8 is for the resulting of the latch through restant is hard. rotating it back into position by means of the push button 10 from the outside of the instrument

Now the compression spring, present-ing an inbalanced force, is designed to prevent the bar from disengaging the latch 5 as a result of cylinder misses coinciding with bad vibration periods of the engine etc, thus increasing the synchronism or from lateral shocks to which the plane may be subjected in landing in intense oscillating shock transverse to the axis of the engine, such as an unbalanced engine-propeller torque reaction resulting from the breaking of a propeller at speed are the types of shock from which the instrument is designed to repond inder such conditions the bar will swing through its full amphitude, raise the trigg; which releases the latch, and thus interrupt the ignition through grounding the magnetos From the interruptor terminals 11 and 12 wires are

connected to the grounding terminals of the magnetos and from top terminal of the interrupter a wire is connected to the engine ground. On the disengagement of the latch 5 (riple contact is made be-

general types maker and breaker matra ments and in various models for adapting it to varous systems of ignition

#### How Long the Oil Will Last ( ntinued from page 459)

to year and from decade to decade, it

might not be so difficult to see where the oil for the next few generations is to come from, but when each generation demands from four to eight times as much as its fathers used-well, there comes a time when it can't be done any more And if anyone desn't believe that we are now face to face with the time when the normal expansion of petroleum consumption must be curtailed he is respectfully invited to contemplate one fact, all the oil that has been extracted from the earth since the beginning of the industry, as indicated in the last section of the diagram, would last at the 1917 rate of consumption, less than 15 years. It would last, at the 1917 rate plus the ordinary increment shown for each year since 1880, a period of less than 10 years

No it is not in the least reasonable to sup-Durcture the gas bag

As to the elements of the dosign of the
Interrupter, these are extremely simple lass given of the fact, recently brought out



St. Louis Grinding

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#### ne Flying Boat-Count Zespelin's Last Production

A MEMBER of the Allied Naval Com-In mission in German waters writing in the London Times, gives an interesting description of a grant monoplane flying boat, which he saw at Nordeny one of the largest and best-equipped of the German scaplane stations and which represents Count Zeppelin's last efforts in aircraft deum

This flying boat has a wing spread of about 130 feet, which is exceeded by that of a number of Albed and German muchines but an unusual breadth of wing of between 15 and 20 feet In surveying the great expanse and solidity of these wings an American officer remarked. I a Sopwith Camel couldn't fly off it while textile diers or similar apparatus. The of Curtus flying boats and incomparably more comfortable. Nor was the boat the only enclosed space. Between the wings was a stoutly built house for a pilot and containing, among other things a sound proof room for the wireless operator One of the German flying officers of the

station gave a brief history of this re-markable machine. The giant mono markable machine. The grant mono check if third to rapidly. It should be plane flying boat he said was the last possible however by proper regulation of grif of the great (out Espelin to the lith dry kilos to dry the wettest panels German people. He completed the design cerman peopii He completed the design of it before he died, but most of the con-struction and all of the experimental development of it have been carried out appointed over the failure of his airship the ground and by airplanes war he had hopes that the Zeppelin might be used for bombing enemy lines but it of losing it was too great. He realized that it was no good for this kind of work even before the Zeppelins began to be destroyed over England. So he set himeven before the Zeppelins begall to be destroyed over England. So he set him-self to devise a heavier-than-air machine powerful enough to carry a great weight of bombs, for use at the front, and this mono plane flying boat is the result Count Zeppelin at the time he designed this machine, did not believe it possible on account of its great size and weight to land it safely on the earth he dicided to make it of the flying boat type. It was to be kept at one of the scapiant stations on the coast of Belgium to rise from the sea, to fly over the front on bombing chose the monoplane type on account of the trouble we have always had from the lower plane of a biplane being knocked about by the waves in a rough sea. This one by the waves in a rough sea. This one great plane, over four meters above the water, is never touched by a wave unless the boat heels over very much when caught with a beam wind and sea. As it is built the boat heels over very murn were well as the built with a beam wind and as. At it is built to turn up into the wind of itself, even with a time from the contragency winding mill train are as site sould as the same even again for bombing as Count Zeppells, had suggested to provide a supposed to provide a supposed to the contragency winding mill train are as site sould as the proved it possible to be displayed as the contragency will be found to the first sould be such as the contragency will be such as the contragency of the contragency will be such as the contragenc

work it was proving highly satisfactory although it had to be flown -and espe-ually to be landed very carefully. We ere using this one principally to train pilots so as to have plenty of skilled men ready to fly a large number of similar machines we had under construction Whether these will be completed new I cannot say At any rate we are covincid here that it is the last and safest machine for leng distance flights over the

Gluing Veneer at Higher Moisture N ordinary commercial work it has been common practice among plywood facturers to dry their vencer down to very low mosture contents in fore gluing is accomplished other in plate reduces object apparently has been to preven that mose-probable that this remarkable entrinking of the acceptance of the appear is a platform and the consequent nearting of its appear machine would provide a platform and the consequent nearting of its appear machine from which the funtasite conception could and. In the munifacture of waterproof her calised. There would be loss room than plywood for ancualt use it was required on the turrest of a battle cruizer but the that the vince rootanh between four per greater speed of the monoplane as compared to a warship would inquisitionally time of gloing. This is higher than was and to a warship would inquisitionally a sustemant in many plants but was still pared to a warship would unquestionably time of gluing. This is higher than was actually accuse a small machine to rise without a destonart in many plants but was still foot of run. One could all but stand below ordinary are dry mosture conditions a number of places in some of the earlier products and them are a number of places in some of the carrier products and the products are the products and the products and the products are the products are the products and the products are the products and the products are the products and the products are the products are the products are the products and the products are the products types of submarines were successful to the hull of with case in glues at various moments on the boat was largely of sked and duralinining tents up to over 30 per cent. It was and basked to be from three to four times found that when very dry venter was and basked to be from three to four times. resistance tests was greatest Veneer glued at 15 or 20 per cent moisture or above gave practically perfect results in the water

The panels made at the higher mousture ontents were apparently as strong and as destrable as those glued under ordinary conditions but showed a tendency to

These results indicate that it may be possible to reduce very materially the cost of producing panels of sert an kinds where Count Seppelin was trribly discinnish is not important by using water sed over the failure of his sirship resistant glue and greatly reducing or even appointed over the latter of the attempt resident rich and the set of the set Before the hable to break or split than it is at higher moisture contents. An additional aving is therefore possible by reducing waste. It is realized that the use of moist veneer

is not practicable for many purposes but (arefully draid to low moisture contents for many kinds of panels which might be glued to good advantage at higher moisture

The above results were obtained with casein glues. It is known that damp It is unlikely however that moist of yeneer would be suitable for glues which are not water rougt ant

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or the work with saturactory results in: British Journal Protographic Almanat, London Henry Greenwood and Co, Ltd, 1919 8vo, 642 pp illustrated Price, paper, 1s 6d net, cloth, 2s, 6d net

Among the many acceptable offerings of this long-retablished annual are the sections sum-marizing the progress of the year 1918 and in cluding apparatus and outpress in negative and printing processes and color photography namerous formulas a generous selection of tables and a great deal of micellaneous information. There are also directories and descriptions of the British societies and bodies and a fine frontis piece filmstrative of the high excellence attainable

to answer them It disregards abstruse and merely loval problems and deals only with funds-mentals The soil the plant, the antimal the farin all present to the active mind questions that are here scientifically but simply answered The experiments given call for no apparatus that The experiments given easi for no apparatus that cannot be found among or improvised from the farm's resources and the arrangement of material idispit the book for classroom use with out demanding a teacher who is himself an agricultural expert

CHIMICA INGRUANICA VOI I Part 2 By Ettore Molinari Milan Ulrico Hoepli, 1919 8vo , 630 pp , illustrated Price L 20

the author of this substantial work is a well-known professor of chemical technology at Milan This is a fourth edition revised and amplified of ids inorganic Chemistry it reveals treatment of the subject with particular to industrial applications and will commend itself to those who can read Italian with facility

Fix compiler of a text of this nature faces many questions of inclusion and excitation. Dr. Trase sean is lit we litbe a tool bottany about de provide a basic for agricultures horiz tuitue and forestry bit ther four takes as a fundamental aim the companie of a little was a fundamental aim the companie of a little was a fundamental aim the companie of the contrast them with enough assumm and increptioning to further discussion of an action and increptioning to further discussion of the contrast them with enough assumm and increptioning to further discussion of the contrast them with a supplemental to the contrast to

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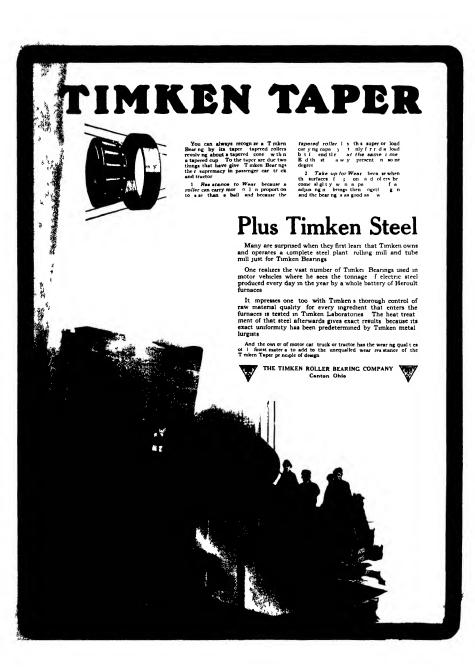
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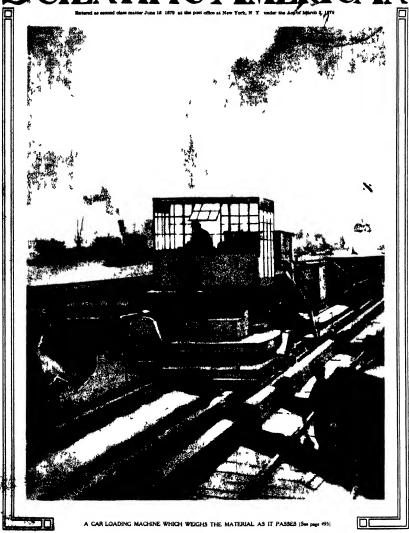
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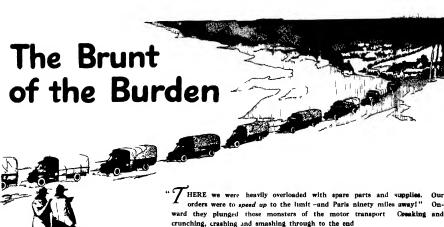




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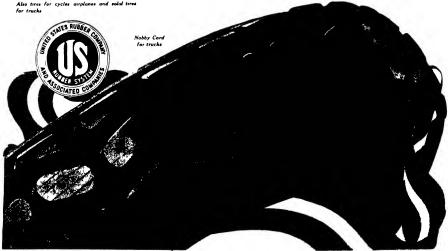
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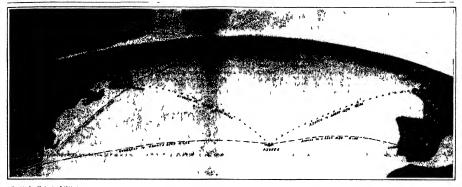
The Solution of Industrial Problems

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## THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX NEW YORK MAY 10 1919

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Routes and distances which are available to British and American airmen who are to attempt the great trans-Atlantic flight

## Our Navy's Bid for the Great Trans-Atlantic Flight

A GAIN the coming trans-Atlantic flight has taken an A week ago all eyes were turned toward Newfoundland where Hawker with his Sopwith toward Newfoundland where Hawker with his bopwith and Raynham with his Martivaside were momentarily expected to start on what is considered a deep rate vonture. Both those small hiplanes were hastly pre pared for the trans-Atlantic attempt and shipped to Newfoundland for an early start. But what with high velocity which storm areas in mid-Atlantic fog banks, ran, marshy flying fields and other i lements of delay rain, marray myng intus and orar rincines of users the present writing finds the intripid British pilots still waiting for favorable conditions to take off as the avisators say Perhaps the ill-fated start of Major Wood in his Short bipliane which resulted in his machine falling

in the water while flying between England and Ireland, may have had a deterrint effect on the British aspirants in Newfoundland at any rate, they are not taking the sheer desper ate chances which everyone expected of

their attempts
Meanwhile our Navys carefully laid plans and thorough preparations have been brought to what appears to be a successful and promising consumnation. Indeed during the past few days the NC flying boats have proved quite fit for the great ordeal before them. And these tests have ordeal before them. And these tests have even encouraged a remarkable record made by a Navy F-5 type machine, at Hampton Roads on Saturday, April 20th, which flew for more than 20 hours and covered a distance of 1,250 miles. The F-5 type is equipped with thre Liberty engines while the larger NC type carries four.

And while the aircraft have been rare-fully tested and prepared for the long flight, our Navy has gone ahead with other flight arrangements, such as a string of torpedoboat destroyers and battleships which will be strung along the onurse across the vast expanse of coesn, so that the fisers at all times will be in wireless communication with naval units. There are several possible routes. The two which have been favorably considered are from Newfoundland straight across to the Irish reast or from New-foundhand to the Agorea and thence to some point on the Continent. Of the two routs at appears that the one via the Agorea is the more likely.

While little is divulged by Commander John H. Lowers who is in tharge of the Navy's attempt at trans Atlantic who is in things of the rays, saturing it trans (timing flight and his men with regard to the lettraces and hattleships which will no doubt spun the occur for the benefit and gindance of the airmen it is quite evident that the Nav is taking no chan cowhisto yer. In fact the attempted flight is not unlike a long distance swim mer who while he must rover the distance on his own resources is escorted by one or in ore boats which are ready to pick him up if necessary. In sharp contindistinction to the attempts of Hawker and Raynham with their angle-engined biplanes in line or nit or guiding

Engines of the NC-3, showing the two regular tractor air acrews and the tractor and pusher air screws of special design in the center

vessels in which event they must either succeed or trust which is which could the mind coan our Navy s attempt is devoid of desperate hazards. It is not a sporting event it is rather a well planned test conducted along som tengincoing lines

More is known about the NC planes which are to

attempt the flight than about the navigating plans. The NC 1 which was the first of its type to be constructed. made a spectacular flight on November 8th last carrying 51 pass agers at a time. As originally designed the NC 1 has an upper wing span of 126 feet, lower wing span of 96 feet an overall length of 70 feet in La total hight of 25 fret It weighs 13 000 pounds empty and 22 000 pounds fully loaded. The useful bad carned is 4½ tons Although a big machine the C I has a speed of over 80 miles in here a 2 000-foot clim! in 10 minutes and a maximum endurance range of 13 hours

Three Therety cugines were originally in muted on the NC1 Each of these being of the low compression type develops 350 horse power. Lour bladed tractor an screws are used each measuring 10 feet 10 inches in diameter
The NC 3 and NC 4 which have since

been completed follow the same general lines as the NC1 except that they are equipped with four liberty engines and the arriver mean at present emission of the arriver wasts of three trills and one pusher. Thus fixing both hive a weful carrying enpacts of 12 400 pounds as compared with about 9 000 pounds for the Net so that the four rigging equipment may be

n iderel far more advantageous than the his engine equipm at despite the weight the engine equipm in despite the weight and full consumption of the extra engine which would require some 4.025 pounds of fucl and rid for a 24 hour hight. It is nucleistood that the NC 3 and NC 4 h vilor a speed of 95 unles in hour and has n han hing speed of 55 miles an limit. II gross loud capacity is 29,500 points although it is intended to start the orin although it is intruded to start the y in flight with not more than 28,000. The other measurements of these boots are (Continued in page 49.)

## SCIENTIFIC AMERICAN

Published by Scientific American Publishing Co Founded 1845

New York, Saturday, May 10, 1919 Munn & Co 233 Broadway New York

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The litter is glid to be submitted to bem timely into less and older for the firms especially when such uti lis i e i compini l'1 i photographs

#### A Neglected Port

III port of New York so far as nature has had to do with the making of it is the greatest port in the world but the port of New York so for as man has done his share as a partner with nature is one of the poorest ports in the widd. We make this statement without any fear of controlicion As regards its loading and unloading fighties and all that ordered admistment of material means to econ muc ends which is the carmark of a great modern port. New York with the exception of the Bush Transit and the Chebra ducks is today, in a parlons state—like lopes at bus met growed

The clear-headed and for sighted chairman of an Shipping Board Mr Hurley more than once has stated that an important factor in overcoming the handicap of cheaper construction f ships in the vards of om connections will be the spec ling up of the form around of the shops of our new merchant marine in our own ports This is to result from highly developed loading and un loading machinery and the carefully planned layout of our dock facilities. Of course Mr Hurley at least so fur as the port of New York is concerned was looking to the future certainly he did not have in mind the existing conditions. At the present writing we are at the state of development where committees investigations reports and much perferved oratory prevail But surely it is about time that we got really and honestly busy in this the most important question affecting the commercial metropolis of the western hemisphere a vast problem which can be satisfactorily solved only by the cooperation of wide experience with the highest technical ability. If we are to had a quick and adoquate solution the whole thing must be absolutely divorced from state, and proportial tedities.

A fundamental our stion that must be decided at the outset is that of location Are the present centers of shipping activity the most favorable or should we de velop new shipping centers such as that proposed at Staten Island or in the lersey mendages?

Another studing mount in himomy one port facilities up to date is to guther complete information as to the terminal facilities of the leading parts of the world Presumably much of this information has already been gathe ed but there has been considerable activity du one the war and the record should be brought up to date

## A Year of the Carnegie Institution

TANKWING the exploits of the Carnege Institution of Wishington is a habit which we should be sorry to chanden. There is hardly any the la montary natural in the modern world respires as with just the same sort of emotion that we have from the Yarbooks 1 that idionable estal lishe at 10 we had lived at Mexandria in the days of the Ptolema, we make have emoved similar thirdly in perusing the period of reports of the Museum supposing that any were assued. The I tolerane investigators had the advantage of virgin fields for their idventures and they must have Indiamazing stores to tell. Research under the Carmene Institution starts at a different stage but it plunges so boldly note the illimitable unknown that

it is positively invested with the true thavor of picnoering Possibly some of our readers have never seen a Year-book of the Carnegic Institution. Let them imagine a volume of more than 300 pages, delectable in type and paper setting forth some of the most romantic true stones to be found in contemporary literature. Not that the writers of these stories debberately court popularity Their language is formal and technical It is faits not phrases, that excreme the spell

One of the many departments I the Institution possesses the most powerful telescie in the world, installed on the top of a mountain it (alifornia. Here is a circumstance to arrest public sitention, yet it is almost trivial compared with the ini total of facts concerning the equipment personnel and program of the Mount Wilson Observatory only the most progressive astronomical establishment in the world Another Carnege department has fucushed a pair of seven league boots to the once languishing science of terrestrial magnitism Biology is represented by several branches of the Institution, in each f which new vistas are continually being opened up Ail so on pretty much through the circle of the scu nee

No educated person can afford to 1 agnorant of what the Carnego Institution is doing to would be a praise worthy undertaking if Director Woolward would issue a popular and copiously illustrated vision of the Yearfor the benefit of the busy average man

In reviewing the report of the Institution for 1917, we indulged in a quizzual commentary in the subject of the upruffed exterior which Dr. Woodward and his associated managed to muntain amid the alarms of the great war I rum the current Yearbook it appears that the establish ment was, in fact, deeply stirred by contemporary events and that its resources have long been enlisted in the defense of the nation. Prol ddy the most con spicuous example of the patriotic since rendered by the Institution is the fact that the entire staff and re sources of its Comphysical Laborat in were intributed for more than a year in the vital worl of promoting the production of optical glass in this contry During this period the output of uncut onto il class was increased from less than a ton a month to me re than 100 toms a month and it was thus possible to supply the Army and Navy with telescopes, field glasses gor sights and various other optical apparatus, despite the cessation of this supply from abroad. Soveral other branches of the institution also to perated activity it war work or were well represented therein through the activities of their officers and employees

At the beginning of 1918 the Institution inti red a held of investigation through the acquisition of the I agences Record Office, located at Cold Spring Harbor Long Island This unique enterpric was previously maintained mainly at the expense of Mrs I II Harri man who has provided a fund of \$300,000 toward its further maintenand

Many of the more noteworthy achievements of the Carnegie Institution during the past year are recorded clay where in our columns

#### The Battleship of the Future

II VI is the best type of quital ship to build for the United States Nevy 18 is considered. to go aloud and build the two types which have been designed for our Navy namely, the 42,000 ton 12-run benyily armored 21-ku it buttleship and the 1" knot eight gun lightly armored batth-crimers that have been designed and appropriate I for Or would it be wiser to combine the two dismus in a composite ship, having something of the gun power and protection of th battleship and approximately the speed of the battle Navy that is the men who design and the men who tight the ships are giving this onestion close attention and already there is a division of opinion - Experts such is Admiral Mayo, Vice-Admiral Suns and Rear Admiral Richman, the three who have held the highest sum inds of the American service in the war zone. behave that the composite type is letter the men who were engaged at home including Rear-Admiral Fletcher and the famer il Board who advise in the material of the Navy behave in holding to the existing types. Meanwhile the chiefs of the bureaus of Construction Steam I squierring and Ordnanie are in Lirope making a study of this quistion based on the results of the war and on the material that was built for its prosecution

Those of our readers who interest themselves in naval affairs, know that the modern warship is a compromise In its completed condition it has a certain displacement or weight, and this is apportioned to the various elements that go to make up a fighting ship, all of which make their demands upon the tutal walcht available. So much weight must go for bull so much for engines and boilers so much for armor, guns, fuel, and general equipment and stores If one of these elements be greatly favored, it will be at the expense of the others, and he is the wise designer who can make a perfect distribution for the particular class of work in which the ship under design is to be employed

For these reasons, it follows that the battleship with a maximum protection has only a moderate speed 20 to 23 knots, and the battle-truser, in which speed is the chief desideratum, carries, relatively to the battleship, a lighter armament and much lighter protection

Now the British, as a result of their war experience and particularly in view of the lessons of the Jutland fight, have come to the conclusion that in a compromise ship of large displacement, embodying the best elements ut the buttleship and the battle-cruiser, is to be found the alcal capital when for the taction of future battles, so far us they can be predicated on the experiences of the war they laid down three great ships of the "Hond" which were under construction when the armistice was signed In agreement with their desire and expectation that disurmament and demobilization on a considerable scale would be possible, now that the arch enemy was gone they at once broke up two ships of the three, but because the Hond was very largely completed, they are finishing that ship The 'Hood' is about 900 feet in length and will displace, on English normal loading don't 41 000 tons, which will mean probably 43,500 tone with full stores etc , aboard . The is to have moderate battleship armor probably of about 12 inches, her battery will consist of eight 17-inch guns, or, possibly, of six guns of the new 18-inch piece, which fires a 3,600p mml shell | The speed will be 30 knots, which is about the best speed of any existing hattle-cruiser in the navles of the world

After a careful study of the subject, the Screwmen AMI BU AN IS included to the belief that the compromise The sinking of three British ship is the better type battle-cruisers by the 11- and 12-inch guns of the Germans proved that battle-cruiser armor, as carried by the British and Japanese which are the only navies which possess battle-crossers, is insufficient to insure the safety of such slips. In fact 6- to 8-inch armor is ab surdly inadequate whereas 12 inches of armor associated with sufficient ileck protection, will give a ship reasonable immunity His was proved in the case of the German battle-cruisers at Jutland, which, by the way, except for the rather light guns they carried, were practically of the new composite type. Increase the displacement of the 'Doefflinger" to 12,000 tons, raise her speed to 10 knots substitute 1 % or 16-inch guns for her 12-inch and you have an excellent ship of this new type

The hattle-cruiser must go it has filled its place in the history of the development of fighting ships and filled it well, but in an age when the principal batteries of the capital ships include our own 16-inch firing a 2,100-pound shell, and may possibly include the British 18 firing a 3,600-pound shell, the building of capital ships whose engine weights are so great that it is impossible to give the ship more than six inches of armor protection, is to invite disaster. If the speed of our battle-cruisers were cut down to .0 knots and the large amount of wright saved in the reduction of boiler and engine plant were translated into heavy deck armor, we would an ideal ship of the new type

The policy of the United States Navy, when war is on will always be aggressive. We shall attack, and one of the less defenses, both against gunfire and the tornedo. is high speed and a quick helin or mancuvering power I ven the buttleships of Jellicoe s fleet, which maintained a speed of 17 knots only during the battle, were very successful in cluding the torpedo, no less than 20, which passed through the line, being avoided by the use of the helm These, however, were partially-spent tor-Had the German destroyer flotillas been less cautious and closed into closer range before firing, the result might have been different. But a .. 0-knot ship with good lookout, and quartermasters who are on th job, would be reasonably immune to a destroyer attack launched at five or six thousand yards

## Electricity

An Easy Method of Mastering Wireless Operating One of the leading phonograph companies has recentjust not one at complete act of matructional is cords and books for those who such to master war less telegraphs at home. The records, together with the books arrest to train the sear to the dots and dashes of the telegraph code

Our Increasing Telephone Service The number of telephones in use in the United States at the close of the year 1917 was 11,713,228—one to every nine persons and an average of more than 200 calls for every muce woman, and child in the country were made during the The total number of employees of commercial elephone systems was 262,622 1 or the 10-year period 1907-1917 the salary and wage payments increased 157 3 per cent, the expenses and fixed charges 126 6 per cent, and the total meome 1122 per cent telephone system, together with the independent lines which are connected with it for the interchange of local and long distance service comprised 89 6 per cent of the total number of telephone installations I best facts are culled from the preliminary report of the telephone industry recunity prepared by the Bureau of the Census

Principles of Radio Communication | the Signal Corps of the United States Army is to be commended on a very excellent work which it has recently published under the title of 'The Principles Inderlying Radio Communication" or designated as Rudic Pamplifet This book contains over , 0 pages and is replete with interesting and instructive diagrams and photographs As its title implies it iteals with the scriple principles upon which radio communication is based Starting off with the simple principles of golvanic and static electricity the reader is soon led on to the clemen tary principles of wireless transcession and reception and gradually in the neitra acres of modern vacuum tube apparatus and so un The buok may be obtained from the Superintendent of Disciments Government Printing Office Washington D (

A Huge Telephone Switchboard I ha tok please quarters in the new Pennsylvania Hotel New York city occupy \$ 105 square fact of floor spine linving an operat ing toom 110 feet long by I i feet wale a terminal to me 30 feet king and 25 feet wide a rest room 23 feet by 1 feet, and a lacker and washroom 10 feet by 11 feet | I be operating force consists of one chief operator one assist ant chief operator, eight supervisors and 110 attendants The switchboard consists of 21 positions Harlices positions are equipped with telautographs used for paging and announcing bis. The switchboard his a capacity of 3 140 ratensions and 200 trunks and is equipped for 2 '00 extensions and 180 tranks | The hotel has telephone serve a man h of its 2 200 rooms and there in 40 public telephone booths second by four switch boards connected with the main switchboard. The make up part of the telephone system | 6 0 fuses 1 170 condensers 2 100 relay 3°0 lamps is 00 jaks

Advantages of the Flettric Range Speaking shoul its automatic electric range an electrical manufacturing company has the full owing to say. The use of the range in the long run is not an expense but a saving It helps couking to become such an exact scance that no food is spoiled Results once obtained can be exactly duplicated Meats actually shrink has in an electric oven than when cooked in the ordinary gas or soul range this method is absolutely sanitary as every part of the electric ovens can be thosoughly cleaned Runges can be obtained in muon stutable for large families and small enough an that they are economical when cooking for The ovens are made to hold the heat Thus saves electricity as most of the cooking is done with stored heat, and it keeps the heat in the stove instead of scattering it in the kitchen or over the house This is a wanderful relief in baking or in any cooking in the summer time The oven will cook a whole meal Vegetables may be put in with the meat at the same time. Breakfast can he put in the oven the night before, the clock act and a fow extra wanks are possible in the morning, for the automatic range gets on the job at the desired time All parts of the ranges are of metal, substantial and fireproof and approved by the Fire Underwriters All of the electric heaters can be regulated for three distinct heats high, medium and low

#### O.Jana

Segmend as Cartle Proof —Investigations of seawerd with reference to the possibility of using certain species as food for rattle have recently been extraed on at the Royal Agricultural Station for the Control of Cartle food at Wageningen, Holland. The price for inclusion reaction is this in the absence of other roughings with red is may be fed to cattle when the submit of lighter has been sufficiently removed. In its bad Jordan's before another roughly removed in the land. Both did red of water to see all of the tartle and horses. In a sublem backle in the following the second of the

A Soil Temperature Survey of the United States and Canada -1 committee of the Leulogo d Seenty of America consisting of Dr I erred Shreve and Dr A F Cameron has organised the important work of making a soil-temperature survey of the I nited States and Canada Hitherto measurements of soul-temperature been made only in a desult its way in this country and the data are not homogeneous. The present plan is to marry on observations at von its places for a number of years under electical conditions I pwards of 30 statums are new in operation. Thermograph records are obtained for thermometer-builts pieced at the sume depth (three in hes below the ground it all stations with addition il readings at 12 me he est cestion stations) in level will-dramed and free from the shade of trees or buildings and under a ground surface kept free from and or werds, but without continuous cultivation. It is haned that the data obtained will make it possible eventually to draw matherns for the soil of the United States and finuls analogous to these that have been lrewn but the air over the same countries

the Bactericidal Action of Sunlight -Risults of aparaments male at Algues to M de I respotts publish I in the Annales de I Instituti Pastein ruch ite the necessity f rowsing current electer comments the that souls lit is booters add only with prelimed a direct moduli or and its action is chiefly effective enethe surf les me lie and mann where his tere is fully export the sun a rays and televiciting inch the la term are only destrated when the light is servanten and then only it hallow depths latel white light is much more efficient than my partially olor d hight Blue light in sle hilly more listers idal thin other load lights Continy for providing opin in the solic light plays but calight pirt in the buckered by tion of sunlight and the same is true of infrared. The luminous part of the spectrum is the most active in killing bacteric. These experiments indicate that in hygiene and the repenties it would be use less to rely largely on the bacterical dir to a of suidight especially in temperate regions a it has no effect at a depth exceeding a few millimeters and is inhibited les than lovers of lat or mounts

Studying the Color of Fishes 1 or about the past Prof W II Longley, of to weher tollege less been studying the colors and patterns of tishes in relation to then hibits and has shown that these colors and color patterns ledge to redder the fishes meanspirmous thus serving to protect thing from their member 1 st summer Pref ser Longley visited Hawari equipped w. h. a diving-hool submarine cameris and apparatus 1 : color uh dugi culty and continu d his investigations in a coral refregion on Molokar Island the werk often : oured how to remain four or feet h urs at a time tack water of considerable dopth Protessor Longies . 1 > best successful in sorting accurate submarine de photographs but only after muck experimenting finds that the serooms wood for color photography in the air are not sintable for use under water It is necessary he says that a special screen stopping more of the rate of shorter wave-length then m required in air should used in submarine color photography and even then the last results at a given depth and time could probably be obtained by its use at only one distance from the object photographed Hawanan fishes show a marked capacity for changing their coloration with change in surroundings or activities Professor I ongles found 27 species representing 22 genera and nine families that

## Aeronautical

Chicago-New York Non-Stop Flight (apr. 1.4). Whate an Arma axist it records the broom Chicago. New York suthant step those establishing an American reason. The left believes table I may not 0.8. Mand landed at Hardhant (4.1). Hand let at 1.0. P. M. covering the detrier of "" nades on sex hairs and lifts manufast. Has verying sept. Two 10.3 Marks (ar. b. ii. and most of the flight ones med. at condition 1.6. I 2000 feet.

American Naval Atrimon A cording 1. I rough received to I transport and possibly destroyed 12. I serious submermes (a spinu) homose (1 royen 1. S. 8), a monotal 1. dl the Initial States naval (autitar large in 1), in c. wh. I received to I maintain throm the off takes a more acceptable of the Initial States naval (autitar large in 1), in c. wh. received to include from the old takes a more nervitive via and 1 acceptable in a large method to I had a States naval forces in 1 rone was rapid. I force in 1 transport method in a more maintain and in the Initial States naval forces in 1 rone was rapid. I force in a professional transport method in the Initial States naval forces in 1 rone was rapid. I force more than two hondrid in spidness of the last types operating from a port mare flower in 1 in recognized that these forces had a material effect in currathing enemy submirrors succession in the I transfer loss of the succession in the succession in the I transfer loss of the succession in the successi

Civilian bising in Great Britain -On Max lst the bun on coal counters was road in for it. Brit in The Arr Manster on preparation for the advent of a mi mercial flying imposed off virings reutes along which the civilera avestors can find card ones and mechanics for their one lones. These thoroughfur's will not only englik ding t communitation lictween I ned ac and Ireland and I sud in in I the north but it s will enter tisms of the acre important towns in the industrial districts. Air france for trille to in 1 ft in excreens nte for the present limite Ita form. At the G CPC NS machines must bull tristmention of got and par sugges the archaus it for contacut triffs Lympos to Kent but little trathe of Hellingle m Suffilk fr Scindingsin triffic it New H Bind or I me doshire and fritialle la fit London at Hans low in Mildles v

British built Passenger Air Liner the Dady Iliqi trodda baysı ko-aptı ıftlenes president in hors recently restrict I at lift in Included by Intlemmenty this impline lose ested the full presences to all trut the O acuta tred trep de iro 112 pers ng is political vist at mal attract an alternative 1 (2)) for in 7 cm let's with a ur spect fitz mides uch ur the process as a constitution of second at the contract of the India a titra or a touck if a pissonica is a they be free land thing cel pitchia ire sach nate all the nathric misers Diftla<sub>c</sub>h aut lense to to up so so sall for the weight to 0) populating word masula trolitiin forlit englet tetles tthree and relation out tt pre the complete especial telescope to the interpretation of the control of the process of works merksel then a two 110 has preverengines the teld from a loang \$1.00 fers power through can I mound one lity my two of the torn agains should the there I teal lown

Proposed Air Traffic Regulation -1 copy of the pat if the lateromistral Coopers on if Civil Acr. ments a whale the Areach Munistry of War less received from the Ministry of Coreing Affins for Lein received from Counselor Robert Words Bloss fith American Imbuss of Pars Thereport agase e tragect of miernalianil romantina a ka ha an navi dei sal proposes teforial the carvon. I means a rapple smes or instrumention or maline without we relaid to tration and to offen the order tour a recorder to orthographic your distriction is vision or made for the classification and one time, did archips whether planes hall sams or hered t tla lists to be exhanged between the contracting a verimients. It is also proposed to stundardore the authors made which navigation harness will be granted to machines and to pilots. Various unnexes to the report offer provisions for the standardirection of lights on auslings and for much and decome regulations, and suggest a number of district signals which it is proposed to offer to a hasis for an international standard code

## The Tank Man's Story

As Told to C. H. Claudy, Special Correspondent of the Scientific American in France

Y is you read a lot in newspapers about tanks. But

1) is were three bittalions of Aurice in tank reope

1) is were three bittalions of Aurice in tank recope

1) is was action one with heavy tanks with this

lightest on the with light tanks operating in the

1/2 and three sides of the tanks operating in the

1/2 at yet who is side? If No you fill have it yet some

act is to talk about the heavy tanks don't know any
thing, bout the n and don't want (i. light tanks for

no every time

Yes, I'll tell you about them if you

are interested.

are universal formulation is light one. Whippet tanks some people cell them. Weigh about war tons and have two men for a cray. East? It is faster than there is any see for them to be really. That was one of our tradities running away from are infants. No seems in having tanks that come get not found which he men they are supposed to meet 1 and blaza a trul fort. Those little formulation are supplying a spelt rules and hour over

sood ground and infacts in bicks of it goes two!

What Oli one of them is the engineer and the other the plot. Some of the tanks have machine guas and some one-pounders only one gun to a tank you know those lettle follows areast buttledings We started in with 20 tanks. They core should \$10,000 each 1/s motor not unlike a good automobile motor four-excluder bount to hoose-power. Indeed the tank has a let of automobile motor motor of the good and the started in the sta

out of lurk sure: brisken legs: You know, or masted ribs:

No the Buche and tank, gun inverburts in a modular
to anything.

Not of a bullet, but unless it strikes sharp
at right angles it doesn tgo through. Pretty hard
steel, you know, that tank armor. What did stop us,
when we were stoppied was the 77. Fvon that took a
direct that A 77 could go off right beside us and we d
andly know. It But if it made a direct the well, you
don't expect to run a war without any casualties, of
off all the armountation in the total. The tank two scraps
steel and the man-well, we found a hand, and a shoe
lust iterally blown to nothing.

'Terrain' Of course there are places a tank can't go

bott read a lot about how a tank loves mud. Don't you believe it A tank can sither around in mud just like an automobile. Of course it can it into it is an automobile of course it can it is just it can telimb at the same angle on mud as on dri, zeround and soembow we always the fight in the mud. I make it is a great place for mud if you could sell it Pian't is useful thave any mutual sleft at all. Mud didn't stop us of course but it mach it much difficult. On dry ground we can climb 45 degrees, and 51 degrees in reverse.

You how a lot about the way, tank can crawl over tennthes. But that a the big heavy tank. The little fillow can I run over a trench the way it can down and up a shell crater. The Renault is tail he avy, you see It gots its nose across a trench all right but if the trench



Head protection worn by tank gunners when looking through the sighting slits

is a little too wide the beavy toil drops back into it. Then you have to get out and dug or get another tank to come and pull you out. This why two tanks to gether are worth four spiritely. They can jam themselves up and still get long by doing the bother at with chains. Once that I know of a tank got stuck and the second dank routin is pull it out. So the officer outside agands sincher tank and it comes up—all officers of them pull the helpless out up and over. He got two of them pull the helpless out up and over. He got the D. S. C for it, that officer.

oner dutate agrats another tank and reoms upthe sude firs, mind—and he hooks that on, too, and the two of them pall the helpiese one up and over He get the D \ \cdot \text{C} for the helpiese one up and over He get to a cancer when you're talked you know As long is a cancer when you're talked you know As long you can move around, the 77 has a hard time getting you can move around, the 77 has a hard time getting you have the part of the substantial time getting you have the part of the substantial time getting to the part of the part of the substantial time getting to the part of the pa why we were so anxious to have self-starters put on the American tanks when we thought we were going to have merican tanks. If there had been any self-starters on our Renaults, wed probably be sky about twenty counties. Engine stalls, Boche gets busy, chap made struggles with a crank, takes time, 77 lands, signal back for a reserve tank to come on into action. No, they ddnt t put the self-starters on Don't sak me why, I don't know

"Sure, the American tanks were good tanks We never used them na etton that I know of Those I saw got to France, or got where they might have been used, after the Armstate. But they were sure American all over—too much American, if you know what I mean It's a national failing, I guess, the business of being ungenious. There was so much impenuity about those instance, machine guin belts. When you use them, they are rolled up and in a carrier. Some sure task builder to be in carriers, rolled up ready for use. When he got through there want any room mastle for the crew No sense to it, of curres, the same amount of aminumition stores fair, and leaves pleasy of mom and it only takes of the control of the crew pleasy of mom and it only takes

a few seconds to roll up a belt and put it in a carrier. Then there was the compass Sume one must have read that British tanks carried compasses. So they did, until the tank crew could throw it sway. So our American tanks came over with the handsomest compasses made you crea saw, regular ship affairs, gimbles and all! Now of course, that a sill foolishness. In the first place there wasn trom for the compass and the erw. In the second place, when you start the engine, the compass And if it was, there wouldn't be any sense in compass. And if it was, there wouldn't be any sense in that sell you justed, not to mention a few officers with flags telling you where to go, if they are not sitting on top going with you.

going with you may the speedometer. Why any one should imagine a tank crew needed a speedometer I don't know. But there it was, ready to tell us just how fast we were going Maybe they thought, down in Washington, we were going to establish a tank speed record or something.

the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s

"Ob, well, I oughth't to grouth We never used the tanks And no one that I know minds much Those Renault tanks were little dandies You have no idea (Con inues on page 198)

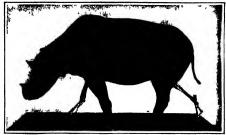


French tanks moving to the support of French troops



French Renault tank with an American crew





The new technique for mounting fossil skeletons. One side of the exhibit shows the skeleton itself, the other indicates what the living animal looked like

## Fossil Deposits of Nebraska

## What Geology Tells Us of the Prehistoric Fauna of the Plains

THAT the largest fossil deposits in the world are found in the Agate Spring Quarries of northwestern Nemasks as fact known to probably very few people out side of those directly concerned in the fossil business or more properly spacking those technically inferested in natural history. To Capt James H Cook and his son Hardol J Cook, of Agate, Neb, we are indebted for this discovery and subsequent development of these quarries through which a very considerable portion of the knowledge of the fauna of this hemisphere in prehistoric times have been derived. has been derived

Captain Cook went to Nebraska in the early seventics Captain vois went to restrain in the early seventus with a party of hunters, the country then was a hunter parame, the bison, roaming unrestricted over the prairies and other large game were in abundance Realising the possibilities of the land for agricultural and cattle-rasing purposes, he staked out a claim and settled where now as the well-known Agate Spring Ranch Captain Cook was not merely a hunter he was a scholar and scalous student of science The fossil bones that he discovered on his land he realised were of great value to

discovered on his land he realized were of great value to students of placionitology wheahugton was notified of these first the students of the students of the students to come and myseligate. The University of Nobraska first took up the work; under the direction of the state goologate, I. B Rarbour, the whole section was ther-oughly explored and many fossil bones removed. Later Captana (Dock) son, Harold J Cook went to Glumbia

University and took a post-graduate course in paleontology While in New York he succeeded in interesting the American Mu-seum of Natural History in these rich fossil deposits and, in response to his in-vitation, they went to Nebraska to explore Since the time of their

first visit they have been actively engaged in pros-pecting and removing specipecting and removing already means at one time, by the second of the sec ns At one time, by mens widely spread epitable caused the animals of rack to the water of the Nio-brara and there in vast ara and there in vast mbers they died and re buried in the sand d down by fi

That they were all covered at the same time is evident

Hast they were all cowesed at the same time is evident from the layer of sand in which they are found. The specimin so obtained from this run represent a large variety of animals of the lower Miveno and upper Oligocene periods. Here has been found a complete sketten of the giant Dinchyus or graving uf the lower Miocene. This animal was most formulable in appear ance, hung as or more feet in hight and with canness that formed stout and heavy tusks. The head was that formed stout and heavy tusks. The head was very long and was made very grots squt in appearance by large bony growths on the skull and jaws. For a pig the legs were very long and gave the animal a stilled look. Another complict ackeletin found is that of Moropus, the clawed borse, already described in these c dumns than

which a nore grotesque creature could hardly be imagined. This maintail lived in the lower Moorn: It was larger in bulk and stature than a large horse had a long neck and rather small horse-like head. The fore limbs wer long and the hind legs much shorter giving the animal a steep inclination from the shoulders to the rump a steep in imaxion from the so unders to the running.

The fest were armed with great class. Almost nothing is known of the habits of this queer beast but judging from the character of the teeth nock and fore legs it is reasonable to infer that it fed on the leaves of trees.

By far the most numerous of all the forsula found in the Agate Spring Quarries are these of the Discreticinum or pared-horn of theorems of the lower blue ene and upper Oligou ne upoths. They were different from all other thinsercoses in having a transverse pair of horns on the

nose in all subsequent two horned species the horns were nose in air vilos quem i wo mornet species the mains were one behind the (ther. These minist were very small not more than half the size of the prisent day Aliacan variety. The is impairing, cuts show the complete skeleton of one of these small animals and also the animal as restored from the skeleton by J. D. Liggins, Director of the Colorado Museum of Natural History, at Denver

This method of exhibition originated by Mr Liggins marks an innovation in fossil display. The two cuts show the two sides of the same exhibit one side shows the animal as it appeared in life, and the other shows the assembled skeleton occupying its exact relative position in the hollow interior of a longitudinal half of the restored animal. This new method of skeleton mounting is now on exhibition in the Colorado Museum. There also may be seen a slab of rock four and a half by six feet in size taken from these same quarries just as it occurred in the formations and showing the fossil hones in high relief

an algorithm. Although promiscuous prospecting for fossils on the land owned by Captian Cook and his son is not allowed they not only printipeople of recognized authority in the realm of paleonted say to take away all the material wanted but such people are most cordually invited by them and treated with the utmost courtesy while them. and given every possible assistance in the work of reinoving specimens. Although most of this work has been done by the American Museum of Natural History

of hew York city many others have been actively interested and have taken away valuable material, notably the Carnegie Mu neum under the direction of O A Leterson, and the University of Nebraska under Barbeur as already mentioned

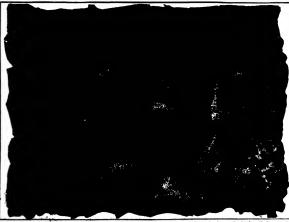
## German Glass "Film" for Motion Pictures

In is reported that a new method for producing motion pictures by prejection through a glass film (as distinguished from the usual commercial film of celluloid), has been werled out by the management of the famous optual glass works located at Josa Germany

This new glass film has the idvantage of being aly one one hun-dredth is large as the film

now in use

This so-called glass' film"
is in reality a very thin
plate of glass upon which
the necessary number of prints are made and which is shifted mechanically be-fore the are It is not known whether this method of projection is in commercul use



Nebruska fessile in sita, the rock having been chiscled away to show the bones in high relief

## Free as Air

## Logislation Needed to Control Acres Traffic

By Our Washington (orrespondent

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that on many art here, the set of man temperature can be compared to the compa

By Our Wenkensgion ( correspondent links are operated by some compute. Support yet had I and ever all others all each less personne extraory are applied for from less yet in the state of the personne extraory are applied for from less yet in the state of the extraory of the state of the extraory of th

in this of may not known held dustring the right of we. Been on good head. As present the catable and mere has a good head. As present the catable heads and mere has a good head. As present the catable heads and mere has a good head. As present the catable heads and heads and heads and head of the plane is taken a great plane or temperature. More year, Philadelphia and Worst senses on which suggisted and how memory and present an adjusted an analysis of the catable o

## Shale Oil as a Business Proposition

A Tunely Word of Caution as to Processes. Costs and Profits

By H I Wood

I'M 1912 the United Plants Co. degreed between begans a market of all shades in Column's Colu

each of measure and upon to the let now known or to be developed. I step depend to this formed coul when he developed he may depend to this formed coul when he to be part of the measure 
## Correspondence

The editors are not responsible for state the entrapondence column. Assesses ment be considered, but the se is will be withheld when so dow

#### The Read Minute

The Band Mileage
To the Adster of the SCHENTEYS ARTHERS
Referring to the correspondence that appeared in
your name of October 26th allow int to add a little to
fix Die Blass a said your date insmoon of they has nonescenIf a a very common one in California. It has but my
supermone to drive for miles along the highway with all
the read, from a few bandwid fire shand of the our and
behand it to the hormon in orther direction, apparing
bin a lake—with these, homan med volucion reflected
print in Mr. Die Blasse has related to the control of the
read of the control of the control of the control
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conditions for second the mirrage in when the lass may be
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own in his drawing fly theory is that the sumps is caused rather by matter than by reflection from a bested layer of an mediately above the road. After the sum has rea-ning several boars that are shown the road in bested confusions from the ground and the first in an of or other density the state of the real of all or other density the state of the state

when the process to greated and when there are the process to a second and a second a second and 
the diagram. Its charge is recommended by the second ray well because the for make room to there its accord ray well because of the from the first the second ray well because all the method that A canotiers the feet of the object are anything else on the ground about that object because all the high! having the feet of an angle still mankly great not to be totally reflected has be to the ground from the under markets of the layers of are well be released still the market can be seen from the second of 
#### Half Moon Boy, Cal

To the Histor of the REMINISTE ASSESSAGE The read manage is very common in the streets of some of our minist. I first observed it in Westengton on Prancylvana. Are necessed 50th fit, N W, in 1800 bly first thought then was to innice a measurement of it

for your correspondence columns but having submit quantity found that it can be seen the realmost may sunmy day concluded that ment people must be familiar with it However, since your having devoted space to it indicates that they may not be the case I appead such other reatment on I have read.

Interests, since four saving according space for it measures as I have made.

At the time measured I meed a become for the measures as I have made.

At the time measured I meed a become for the application of the theory of the application of

amphal; and in bouth I came I have outs rived it was or three tures only on an orthomy pursue duri read. It is nesteral that thes surage should or or more frequently as couther, demands than m orthers, bessee at a prob-ably more or less of a rardy in n est of our cattes. While on the subpast I may point out that the prarre-mange whereby trees, buildings and other objects on the edge of the borsons, that or more main away are surveyably areas in summertures or practed by a laver of more properties. surer anally seem in measurefuse is paralled by a layer of sky from the ground, is just the opposite of the read intege or of the desert mirage to set the pashs of the results may no concess to that you and section of cancers. This kind of suremen is the miss as that seen over water anywhet a long the New Faginal of seat and perhaps else where it meleculas that the air meet the ground is copier that that immediately allow it love whether

The read marage explained on the ground of refraction showing why the image appears inverted

should be so I leave to some of a sur o ha arraspondents to explain

( W COLLLY

In the lister of the Scummers Avenue As 11 to read your description of the read merage and have greatly expoyed the same. Haven, he did 100 theo may be peter for four years makes at did it enteresting

have greatly engoged the same. Havin, in d in Ohnoma Woodel for four years make set dulls in citeding to me. I a ver saw a mirage in Ohnol in vertal versus part and of not appearange in the outsiders of lock to behand the regions. It have seen ments mirages in the contract of the part of the contract 
To the Dirice of the Scienceper Autrimean
As regards the suggestion from Lene, once writing
the intern which you published before I have some the
reference on order days, but much close to the outries
of the ground and requesting in brighter wealights. The
long-durinous sureques growns of an tire above before are
mover soon as this part of the occusity: so far as I can

kars the is perhaps due to the bro en surface largely covered with trees and the presence of more mountur in the atmospher

In the Lister of the NINVIPP ANDII AN Perhaps it will not cet v. (to lear if it a recent in fine and with who may be considered in a state of principles and the last office is very moral if not that he has office is very life very to receive bear no Nin Nin Nin Perhaps the same of course at about of the principles and it may be a limit worst where and it may be a limit worst where and it may be a limit worst in the same of 
In the I later of the SCHERTER AMERICAN
I have read in the SCHERTER AMERICAN of the 28th
Krisher 1919 in a strike evidented the Road Morage
and it are in that such a phanomenous were in your
country. In this connection it may be of an evel to
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of the American Scherter with the strike of the connection of the second schere in the second schere in the second schere in the second schere is a country. your readers to know that in Male there is a country when the Mining in characteristic via the Virtui of Messian. I coloring from the Calabria count the observed frequently not be house of Minimon, a town on the opposite above about 10 kidomic trac distant, referred in the size. In the house not no called the beats Minimon at the size. In the size, the house country of the size of the si

house was in counted
Your explanation of the phenomenon as quite correct
the only essurial conditions to produce et as a very clear
and caim amoughts. In these conditions the atmosphere is composed of different layers of heated are
flew lancer have different referret ry note a and a say
and existed from the strength line until at strike a stratum
and that we have the first the produce as we refraction
and that we have the total referret in the raw being
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How Best to Make Amplenes Safe

To th I dity of the San weeps American To the I date of the van event American in the circ up and net column of the 5 in easier America. March with 1939 the ab we unlique in compact naively to still the writer agrees with Mr. Custin April that the modern para-chule is made justic as a days of each ty for anythmy. After elementing au-slines according to the columns as

Cut in April that the resident paraturies is take put to en a deart of each
in far avaiture. Mitre elevating autpiene a take to take the city, creat
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## Our Marked Highways

## How Their Marks Have Led and Misled the Innocent Tourist By Avia Gordon Vestal

I have not then 9 000 andes of touring I I have not a the requirement of all of the first of the first transformations, refer to the little for the first transformation, refer to the first transformation of the with less to this is to all these I base at the st milit accessors to fell w west in left face wastate. Hineas when vesting places tway from the more lacks

After all this experience. I must own that I to I no re or I so maluard to puse up the traditional I used attention receives good

not retrieved to self action of receiving seed that and point and it repring them according to whiter the strong rian follow them with some indeed where he wand while he is going, or whether he can only specialty or those points. In other words there are marked reads and there are unmarked rough the matter further among the innived much their are 1 indeed what are including with smarked and their nare wise should be are intelligently marked and there are roots which as not there are ruds who have marke becoming usly and rouds which are marked but internationals ranks on which the marks its maint and and raids on

which they are u.t. In michiefered me temmes frequent halts to The machineered mass is possible to often these ask lacel residents to point the path. Toe often these ask lacel residents we wan lawned directions or vogue and rado-sing. We soon learned that it was the part of wisdom task at least two different and number and then to see hat had for a deciding vote informants and then to seed or than I for a deciding vate. But one often is quice a signal when no human is within

As I see it it is in resignation of this state of iffanthat certain accepted motor routes between the several actions of our country have been dignified with one It is in further recognition of the necessary for keeping the tourist straight in his tennings that a distinctive symbol has been adopted for each of these trails and that this symbol has been in or or less systematically and more this symbol has be it in ore or less systematically and more or less to support in 19th and it more or less to support in 19th and it more or less to support in 19th and it more partial on a thilliance points at a unique the partial on the lightest partial on the property of the state of the sure of the s

and steep hills he the and wester of some western regions, tla tenderfoot iven the subber the tenderfoot can without blazoned trails casely add to losing himself the perils of finding ne water no rench in gange

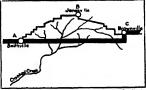
Named and murked reates are still young in most parts of the Inited States with their blid ding powers they couple certain chronic wishnesses I ven the best have their ninging links Too often reads one designated are neglected until the nurkers to come illegible or arm poles are set which do not collect then inheritance of syndiols. Some times there are interludes of miles where I was mutative hos not yet Iten aroused to do its but Some times to all riv dras between towns have resulted in painting in authorize falterentive ionforwith ant proper placards at the punc tum to rade its their true char actor tiller mean little com-petitions have led the citizens of some prinate community to destroy them or move them across to their pet branch of the



breeting 1,500 signs along the Lincoln Highway between Omaha and Sait Lake

read. A source of orror in the 1 i West is the fenting in of man open grazing bands through which the trail fumerly meandered. Another wakness cames in the setting up of new crossroads after the marking p bern through making coincis with contine because

he general the trail in essect fall w through the



wonderfully clear sign indicating when and why to take the detour that avoids the waterways

country than in the tawns tr songs are fewer if all countrs are marked one can menge without markers electric the take the thought the reasoning, t pick in a symich mark and then to indicate that one is on the right trait. Where paint de poles are lacking a thoughtful farmer will sumstimes paint the highway markers on his fine posts or mail box or even on his sil.

As most highways make frequest angles one can

never be certain, in the absence of a mark, that his proper course at any corner hee strught sheed, even though he knows that to be his ultimate direction. I have seen more than one encarceasts with a single pole eastly at the corner. Does this neun straight shead or terri. Even two plots may be set ambiguously. The place of more than a single shear of the strught of an arrow or a hard, or the setting of more but close enough to be varied from the close enough to be varied from the vices enough to be varied from the word reserve the difficulty here.

A symbol painted too low will be overgrown with woods in the annary Worsen's tract along the Cannon Ball Truil. Poles originally marked with black bell and Cast ground and been treet. In their new positions the marks were as triadly half burned, difficult to find when the ground was been and quite out of sight when there was any grass.

Bait Lake On the straightaway course through the country one must slow down at every corner to read the marks and he prepared for a turn if need he Ihn could be clummated by the placing of an area about 100 and he force cash corne, to indicate that the course was not going to turn off. This arrow, or pulsays head may be painted on the position of the straight of the course was not going to turn off. This arrow, as most well as the course was not going to turn off. This arrow, as most successful to the course was not going to turn off. This arrow, as most successful to the course of t the town

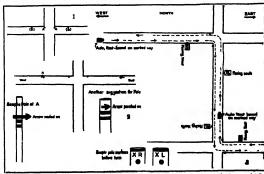
An alternative routs of real acrose when properly de ignated may become a frightful numanes when its de ignated mass heroms a frigunul numane winon in-character surp plants undusted. There may be a short and direct route across the hills and raviness between buntistile and Brownville inturequelts wooded and quite passable whin der. This shuild be the main route. The second or optional ruite follows an indreet course was Juneauly, rossing but one of the many tributaries of Crooked creek at will be asfer and really time saving when the they is suit I us make the loop a source of satisfaction rather than of disgust the replective threat for mild the run router should be indicated on the sign at the point of divergence. This might be out the vigin at the point or overgence: I am angust use done in the rive a sign that gives full particulars, or by sents such with mer of graphic representation as that shown in the vit. Presumably, if the clones is left to chance, it is a fifty-fifty split that the metorat will make the advantageous selection. But it would be hard to convince him that the odds are not about ten to one against

There is another type of trouble frequently met along the 'Black and Yellow in Wyoming The route on-sists of a winding course around an interminable series of buttes. As the land is un-

fenced, anyone can at his in-dividual whim break a new route in the hope of avoiding ruts or finding a less steep grade, ac-cordingly before nearly every cordingly before nearly every hill the winding trail splits into three or more divisions, with no indication of which one should be followed Ordinarily these branches would meet on the far side of the young mountain, but sade of the young mountain, but there is always the chance that they will actually diverse, never to meet I don't suppose it is practicable to label as ands overy detour which every motorist estab-laises through this country, but it should be practicable to label as unand those which lead no-

where

A fault that causes much confusion along the Burlington Way as
that the faceler lines are marked
identically with the main route
Furth ines, if it is felt advisable
to label them as part of the main
route at all, abbidd use the
symbol of the main hus plus come
additional distinctive mark. In
the case of Luncoin Highway
feeders the male line evanhol is



en at B B are definite (2) brings out this suggestion is How to hoop the tourist on his track

used, with an arrow penting in the proper direction, and the words "To the Lipcoln Highway " This seems to be

For convenience in night towal the palm must be warded to lows's Great Witte Way O' course of all entired routes adopted the same three-foot white band in their point, they could not be a distinguished from one mother, but enough modifications should be possible to a country. The telephone nels— \*\*

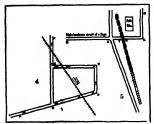
another, but enough monimisations among no parameter go around to go around. The telephone poles is the universal enzyme of highway may be a supported to the property of the discriminately without stopping to consider what these

The motorst s difficulties in driving through a town ans motorists until unless in criving through a town or city are somewhat different from the onest encountered in the open country, yet they are none the ker nal. If all towns were travered by a single business street in a single straight course the matter would be simple; nough

single straight course the matter would be simple; nough but this is far from being the sase. The routing of the trial through towns is highly individualistic and most anonying. If may pass by within sight of a town ir out of view. It may enough the muterate source may be approximately diagonal or he may be led useful may be nown and out spain in a loop paralleling his inward iours. His may even be obliged to circle around Podunk and one out again by the very road that

and orms out not state to the active that brought him in T and come out to the active the active that a consist led into an undercasary amount to the proper course. When enough them a large dresder upon our way to provide for all our purchasing needs we would fronticitly sering alternation and the proper course. When enough them are produced to the proper course to the proper course the productive the providing recognised loops, so that the long distance tourists with no interest in the villages could ride straight ahead, while the local traffic which must enter that town could use the alternative route? As an illustration of this suggestion, I show a sketch of our setual route through an imagnificant Kanasa town where we were obliged to med out of our way and times cross a rained at grade

insignments a name town wares we are outque a ride out of our way and twee cross a railroad at grade although there was an equally good street which would have taken us directly out nurway had it been so placarded that we could have found it

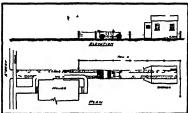
although there was an equally good street wints which have taken us directly on utway had it been so placarded that we could have found it and the second of 


In (1 is shown bow the toprist is forced by its rat tarker to make a long deter through a village when a track road it E was available in (5 the marker at \ is marker to make a long date: three direct road B E was available in (8 hidden 1) a train standing n) the cross one at \(\bar{\chi}\) as well

The confusion of the tourist, as developed by two small

## Lighting as Automobile Driveway By Evan J Edwards

I is not at all unedgement find in antimobile drivi-between a hone and a gain rin i just a linear time to irreduce to the more pertualizing wet wither acquarts steering is necessary while the car is being backed at to the street



The situation that makes backing down the driveway difficult

The pr blem of lighting such a drive at night has in the metanic been solved by in unting on the rear wall of the garage at a height of our f at from the ground of the garage at a height of our f at frum the graund and adstance of ax muchos nuclead the left aide of the drive a regular spot light intended for the windshild. The light is mounted low so that it may also to under the fenders and running-board and light the drive to the rear of the car in a stampling to we then without them may be trouble from objects in the path of the beam may be trouble from objects in the path of the beam casting long shadows not parallel to the drive their liy causing some confusion. The ran he around by placing



The driveway Huminated from the rear wall of the surrey, so that backing out becomes almale

a small past a foot or so high so that it will rast a long shadow via thy purallel to the drive, thereby providing a definite and neurate line to store by when be king

487

The spathight may be operated from a city lighting circuit by the use of a righter adjustable voltage too transformer for reducing the 115-vilts alternating cur

rent to the 6-8 volts required for the lamps

This arrangement has been in ass for some time out has been found very settleful they

## The Strength of Commercial Liquid Glues

M(N) of the commercial liquidgle s are manufactured from the skins heads and symmus, I address of his Other ear made by special treatment of the place streated from the highe skins and 1 mes of cattle, sum for apreal uses are prepared from starch from

At the Lorest Products Laboratory tests were mad by mapers is on a number of these liquid glines which showed that they differ very widely in strength Some of them are so weak as to be interest unsuitable for wood working, p. 15 × while others compare fit smalls in strength with tir let gluss. It is gluss it tid varied from now while evert of a linding first floor than 20 poun lepers juint inch teats with an addless. Strength 80 times as girst or may than 2000 poun leper square

men.
Is juid glius may be tested by gliung tagether juirs
of specially sele ted bird might blocks placing them in a
testing machini. In an earing the form a juice to
share them apart. At it 200 specimens, injunctions
26 different glius here been testid in this way at the
laborators. ab different pulse has been testin in time asy at time.

Laboratory Act i ling of the data thus of tained a high grade linund glue should have an average elecating strength of 1700 or 1800 punde per a just in the landditt and timeform high different struggler at the cylind that of vision their idea; testis a

are distrible in a highed plue. When spread up a went suffers at should set and dry inguilty line atom referendering and find and warfall tall cathour temperatures It should be alternough the constant. It should not be unusually susceptible to the action of high temperatures high humidity malls and be team

the simily gave evalent that the strength of liquid glar like that et her Line di purdeling by up not be not very more thanks are thinks use on strettly of though upon the viscosity. Of 11 had play a skinning the line ket are most very a fallow showed the greatest adhouse strength.

## Piling of (oncrete Pipes

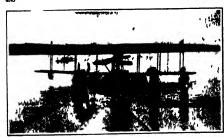
Dill's made of con rete are a new develto punnet in some questies and have been
replicing nation pages. Hay are took long
used mate of of want her pieles in the construction of
whatever in Tasmania. A Tasmanian paper reports
that the first of 600 concrete cylinders was turned. out record) the cylinders to it used to build the wharf imade the new brishwater at Burme for the accommodation of deep seasons while

at remmodation of deep at views .

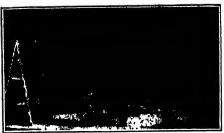
The plant has been installed in the blockyard at the harbor and the pointedings were in the nature of a trad. The comerte cylimber are 10 for though y 4 feet 0/2, not here in diameter the control being 12 mehas in thick-

lo pr duce them a steel cylmiler is placed on four wheels, and driven by an ilectric motor revolving at the rate of from 250 to 500 revolutions per minute the con-crete is thresh in and the centrifugal force thus produced gets rid of the water. It takes about a quarter of an hour from the time the mold is set in mission until the concrete cylinder is ready for removal, which is then lifted to a cylinder is mady for re moval which is then influed to a sciencing place by a rain. There is 1 min pipes can be turned out in seven minutes. The firm make down to chinch pipes and the molding cylinder is revolve at a much more rapid rate for the smaller work decreasing in spood with the increase in this size of the pipe. I obtain the necessary height in constructing the wharf the concrete epilinder will be place I on top of each other councised together and secured lev an 8 min state band on the outside at the junt. I be hollow space in the cylinders will be filled with said.

The pape company secured during October and November last orders for large quantities of court te piping. One municipality has ordered 5,400 feet for 250 pounds working per seum cold mining sompanion have ordered spring for per seuros from 150 pounds down to 50 pounds. Other orders have come in from country distings for subsect forms as the Some accountry distings for subsect forms as the Some accountry. to 30 pounds. Other orus is nav dome in from country districts for outwerts drains etc. Some excellent test results have been obtained with pipes. Two lengths of eithel pipes into intended the pipes. Two lengths of either pipes jointed together with a collist point have been tested to 300 pounds per squares such without showing any agins of leakage or sweaking.



Palling an H S 1 type of flying boat up the runway at the L'Aber Varch U S Naval Air Station, France



Assembling the H. S. 1 and H. S. 2 types of flying boats at the Brest Naval Air Station, France

## The Seagull Flies

## Special Factors in Connection with Naval Aviation By Paul J. Haaren

WHFN aviation is the topic the pix ture conjunct dup the popular main or that of two pursais plants organized in a triming are factly and read to the pursais plants organized in a triming are factly and read to loss diversed and pinals converse must and all the other trees that had appear converse must as and all the other trees that belong in the hope of the powerint input. He have seen the pinals converse the area of the day the acc and read of his wound real organization and are the pinals are the pinals are the pinals of the second pinals of the pinals

White from hose transland the publicity of land flying Navid average in a term of suggesting such as deep represents the transland flavors mound. They have he and of Quite a key of their recognition to the first such that a deep representation of the mark attribute their recognition to under the best artificial to the street. It the greater memory however the mark and offer as a marine. Navy, then we have for the presentation of the with the Navy, then we have for such as marking to do with the contract of the same thing to do with the market for the same thing to do with the market for the same thing to do with the market for the same thing to do with the market for the same thing to do with the market for the same thing to do with the more same of markets, to these

us done how they do it such what it is done with senser less of a matter to them.

They speck at hydrophases as of are rill not knowing that a hydrophase is nothing hot a type of speed boot that loss nothing to do with Brang. What this really mean to rifer to as the hydrosurphum. He word hydrosurphum itself is more

hydroarphine itself is now obside Wake accraft reither scap mas (modified anglancs with one or two floats in place of a landing get) or flying boathe bulls with wings attached there to

The progress in water flying his been fully as rapid as that in lind flyor, the type of plones seed by the Navy has been chunging constantly and is even now undergoing rapid modden

The earliest appriments were made with land machines on floats I hese werring a float of the second 
shi amount of time as compared with other types I mally a me line was evolved which had the qualities of the land mus hine as regards bandling in the air proved satisfactory on the water, and must an ideal muchins for instruction purposes. This me lime, was adopted for elementary training and a shill used for the parpose lar even of control maneuverability and dimability in the given cutter satisfaction. It is also make the many interest satisfaction. It is unfortised in the principles of their satisfaction. It is unfortised in the many interest satisfaction. It is unfortable to obtain the principle of with material to a possible of the control of the control of the sate of the sat

wayer of any height.

A clubble positioned heaver trye of maplian was also divided for instanced between the cash parted work that the control of the contro

hard see landing. In the event of motor trouble while on a patrol the result was usually a smeathed plane and more than often a lost plane, together with the pilot and his observer.

more than often a lost plane, together with the pilot and he observer.

The frainces of this type of seaplane led to the adoption of the lost idea. Monthications were made of the T-bort hall. It was greatly enlarged and improved and remained for the British Royal Newel Alfr Service to make the first successful use of the Porte type of boost and for heavy seed out. At the times boost, having an anomonous unappears were the times to the heavy seed out. At the times boost, having as sources under the times the service of the times to the times to the times the times to 
This condition of being hard on the controls is due, of course to the carmonic sate of the controls themselves. Upon the surface presented to pressure does the case of control depend. The rudder is as large as the sail a small boat would carry. The alterons would compare in size with the wings of a small is out plane. Many

neithods have been track, and are now meeting with success, of causing the stiffness of their control. The general of the altrons with the control which provid astifactory but entailed much more manupulation of the wheel in maintaining lateral balance or when banking in turns feweral types of feiror motors that the control of the wheel in the mechanical systems. First, or entrol has proved the best It is smple, absolutely dependable and operative assity. Thus is grobably the type that well be installed on all the large flying boats.

The redute of operation of these boats as quite large. The smaller, with one motor, has I sel capacity of a little over five hours. The discover five hours of the discover five hours of the standard of the wand, but figurang the speed as 60 miles an hour and the weather conditions to be normal, thus whell allow of a continuous flight of 300 miles The larger boat, double motored, has a searches emeant finel to held a searches emeant finel to held.



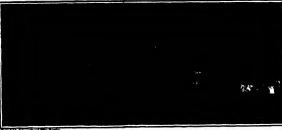
At the Boston Aviation School. Heisting a Burgoes-Dunne machine out of the water and renning it into one of the felding hangers

ame hours The larger boats are slightly faster than the motored boats and with their increased especity could he orbecth oc

Of course, continuous seldom, if ever, att But it is a comforting But it is a comforting knowl-edge to know that you have a marma of hun of miles in your gas tanks when you are a hundred or so miles at sea

These boats are flo mes a naval eraft, on principles of naviga-There is not the least

toon There as not the least bit of generous's statehole to it. Navagation as aub-port that the student await aviator cannot well afford to sugar the student await upon us in our student days is when as gound school by a Royal Naval Ar Servir-pilot, on what we may expect and what was expected of wwhen we got abroad. The speaker, a true Reituber but of Irash oragan, still retained a bit of the broque of his native soil. At times it was a little difficult to under-stand him, but one thing we did remember of his talk



me Army radio telephone equipment, which, in the order shown, consists of a wave generator wireless telephone transmitter and receiving set, vacuum-tube amplifier and loud-speaking telephone

## The Martynside Trans-Atlantic Airplane

Willie the trans-Atlantic sopwith and short together was allegated to together with a subsection of the same and together with a complete description of those machines as will as the Martynaide it was impossible at the time to illustrate the last-mentioned type Sure then how wer the accompanying photograph of the Martyn

## Recent Novelties in Public Speaking

highest climbing airplant in the world I tilly loads I th trans Manta: if for spin Martyicade weights alcut 5000 jounds and airps

crusing equalty with 20 and with a lightest it did

d it spot to one unto

windstam resetterspel

In the ur th Murty used mikes alout 125 mike an

hour as compared with al aut 106 for the Sepwith after dropping its landing gear

aropping its landing gear It is equipped with a Rolls Royce Falcon engine of 280 horse power

cardy aver 4 000 mily themly aper 2000 and Hwyer the annual

and make they

11

300 gailons of gasoline

Wind within the past few woods, thanks to the intensive application of the vacuum tube amplifiers and the loud speaking telephone. Indeed during recent Victory Loan ere manus, the amplifying and loud speaking telephane equipment has made it possible for a



pasking telephone together with a multi-step vacuum-tube amplifer

was, to put it in he own way, ' If you dawn t knaw your navigation you're nave worth a don' '

It is the duty of the navigation officer of the station to figure out the ocurses which the pilots are to follow on their patrol. This secentates a knowledge of the space and direction of the wind speed of the creat flown, devration of the sompless due to the steel in the plane and the variation of the sompless due to the steel in the plane and the variation of the sompless due to the steel in the plane and the variation of the sompless due to the steel in the plane and the variation of the sompless due to the steel in the plane and the variation of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the sompless due to the steel in the plane of the steel in th wanse that must be made defit. It is usually the stant pilot who attends he corrections to be made ing the flight. For this page he uses a Batten-g disk, a mechanical con-ance which indicates the



Original radio telephone used by Col. C. Cuiver at San Diego, Calif. in 1916

side trans thantie biplane has been received from Nowfoundland

Nowfoundand
In Martynside, which will be used by Raynham and
Morgan is more or less like the famous Martynside 1-4
a machine of a type which was nevy used on active
service although a year before the end of the war it was
by some miles per hour, the fastest, as well as being the



Row of loud-speaking tolophonos installed during New York's Victory Loan drive

speaker to addraw a rowed of true of thussands of pressus of creating, for my than a number of a mile pressure of the my control of the my speaker to address a rowd of tens of thousands of

unpus Along a five which has been cleborately decorated with plaster col decorated with planter colunns flass captured guns
and even two pyramids of
terman helmets there have
been installed some 202 loud
speaking telephones. Pach
to lephone is provided with a
phenograph hora, and is suspende drom a cable stretched across the thoroughfare which has been re-christened Victory Way for the duration of the campaign is veral suspended from ca h lateral

(Continued on page 499)



stic sirplane "tuning up" at Newfoundland, preparatory to the great flight

## Mechanical Equipment of the Farm

Latest developments in agricultural machinery and practical suggestions for the farmer

Conducted by HARRY C. RAMBOWER Professor of Agreement Proposering Obio State University

## Roller Bearings in Farm Machinery

Roller Bearings in Paris Machinery
Title is Frail it rings in view types of machines we are used if rough from a lines we are used if rough from a lines we life it is rough from a lineary we life it is rough due and the mover on life limits, it is life it is the first control of the life is life in the life in life is life in life i

I cross B at a shift learning C. The chan that repair left compared with a market left learning beautiful to shift learning beautiful to shift learning. I write the different memories of beautiful to shift learning with left learning beautiful to the different learning beautiful to begroups on the gram wheel and other cans as roll remat



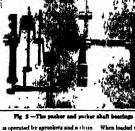
Ten-foot tractor binder completely equipped with roller bearings

shown herewith. It has a 10 f tout and is designed as a trot 1 binder. There are so in features and e from its 1 fter bearing equipment the er werths of special 1 its C. It has overhead packers such as in the partner it is all has overhead packers so shan in the pattern. This arrangement it is thought is it in it is prevent the logating of the dock which frequently accurate the house drawn hader. It should be resulted that had not lead in the should be about the should be read to be a first that had not paid it had not placed by the life of parts support to the the packed up in they much that the opached it is did more quickly to discharge the highest hand. discharge the bundle

The Lundle carrier too is un | it As shown it is a platform equipped with a rolling anvas. This canvas



is operated by sprockets and a chain. When loaded with hundles the operator throws a latch into engagement, which operates the canvas and packly discharges the When loaded with



A New Idea in Heating Systems

A rew woed me recently Systems

I many vections of the country of requestly becomes

reclaim To heat such a house verificing to be selected to

reliar To heat such a house it his became to rereliar To heat such a house it his became to use

stoves in the several rooms. I condification of the

common hol-water heating systim has been arranged

for such conditions as shown his with the

The bother built in small universe phosed in one of the



Heating system for a house without a becoment

proms and serves as a stove for that room. Pipes then and from this besier to mission-planed in adjacent rooms. The first him-olyse is taken unward to as high a point as possible where an expansion such an amuli capacity is placed. Each reduktor, has a roometton to the return pipe line kading back to the boile: While the pipes may be concessed within partitions, this is searcely practicable, where the restallation is made in an old lower. When the rooms are inful view.

where the listshation is made in ab old house. When the pipes are in full view a couple of coats of siummun paint makes tham very presentable and, in fact, starcely noticeable.

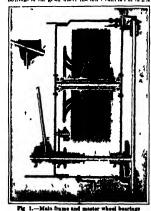
ge screeky noticeable. With such a system the circulation is posture and an even distribution of heat is assured in all posture and an even distribution of heat is assured in all comes. Add to this the remarkable convenience of having only one store to heat the whole house and its advantages are clearly seen. In store is transmed in nickel and is quite attractive. It can be built in printing a substitution of the committee is that there is no be negated according to the number and size of the rooms and the expenses of the house



Fig. 3.—Relier bearings in upper elevator reliers

Effects of Alachements an Guellity of Work and
Sifects of Alachements an Guellity of Work and
Wiffigur question plownup is the fundamental
field operation on any form. No suspic tent on
operating the company with a suspic suspice of the company with an analytic part of the suspice of
operating the company with a suspice of the covidege concentrate the opportunity of
its in difficult to understand how one one
is a statisfic with any suspice of proving The

The a



shown making a total of thirty two roller bearings

With mt question roll i be irings will materially ses the drift on I madelition they require much less attention for lubra stam purposes. In the grain londer for example, the cunyas roll is the jet ker and jetman

should have steparte coled three of the should have steparte coled three of the themse a day Roller bearings will need coling but one or twee in a season test how for roller bearings will be used

in farm machinery is a question hard to answer Cintination rolling coulters and answer ( mi matten rolling coulters and junters for plows are new houng equipped justers for plows are new leng (quipped with r lie bearings as are citain bearings in grun threshers. He y will in time be red in sulky plows in enlitrators in grun drells in dask harrows in feed goal is wooding muchanes and possibly minimizers for the one hings where reglection of draft required to just them of gower to drive this use and the forest forms and the comments of the to drive them is an item of consequence

The in rase hers of the machine due to the instillation of roller bearings will act to retard d velopment in this lime but some progress will surely be made in the years immediately before us

A photograph of the binder discussed in

## Remarkable Example of Camouflage

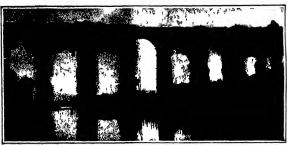
To the couthwest of Mont-dulier, which marks the farthest westward advance of the Germans in the last year of the war, there is a tall stone arch bridge. As this was a very complexous structure and one size to attract the attention of enemy contract the attention of enemy the structure and one size to attract the attention of enemy the said of making the bridge male complexes were given the task of making the bridge male complexes might seem. Viewed from the ground the bridge was complexed us bridge was complexed to the said of 
clothe the bridge with "grass so as to correspond with surrounding vegotation By "grass" we do not mean natural vegotation Real grass and branches were used in certain cannouflage work, but the material had to be renewed daily because of the witing of the leaves A substitute for such perhabile stuff was made of canvas and incting painted a leaf green. After the leason had been learned that the green of the artificial

'grase' must be not merely a visual match of the natural leaf green but also specifresopically the same, onemy airmon found great difficulty in distinguishing objects covered with artificial verdure in the case of the Montdidire bridge the clothing of 'grass' produced a most pretureque effect giving the structure the spearance of an inve-overed ruin.

### The "Killer" Whale

THE American Museum of Natural Hustory has recently placed on exhibition a info-mend model of a "Killer" whale or "Orea" which is one of the most feroctous animals that inhabit the sea. It will attack any living being within its reach, be it fish, flesh or fow! The animal grows between 28 and 10 feet in the control of t

their only defence u in flight! He hig gray whale is so afraid of the ores that it become paralysed when attacked. The oresa are said to be particularly fond of the tongue of the whale. A number of them will attack a gray whale, worrying it until it opens its mouth, when they will dart in and bite off its tongue. Seals, porpoises and fish are the principal food of the oreas The seal are not even as of when they are sahors, for at



Not an ivy-covered rain, but a cieverly camouflaged bridge

any moment an oros may dart out and sease them if they are near the water's edge. Birds too are captured in this way or when awnimals. In ora has even be in known to attack men who wer on clarge cake of floating is a like while repeatedly hurled itself upon the ice in its efforts to reach the min

Apparently the orca has nothing to fear. He is not hinted by man because his bluller contains httle oil

Model of a "Killer" whale—the most feroclous animal in the sea

and so he is free to roam the seas, a terror to all its in habitants. He may be found in all occans, but is more frequently seen in the northern Pacific waters

## A Famous Great Lakes Steamer

THOSL of us who visited the World's Fair at Chicago will remember a large passinger steamer of unusual design, which carried great crowds of passengers between

Chicago and the Fair grounds We roler to the while tak Christopher Columbus, which ferms the sulpct of the accompanying illustration. Hat was 26 vers so and it was 26 vers so some of in to learn from its design. Mr. Mannler Mr.D. gall that this vessel, color illustration of a that it is a circle of the settle toll is circle. I making to the coronal sect of 20 miles

an hour. The whole in 1 ships were built to cube it ritinites of Mr. M. Dougall as the form of ship which would handle itself most confort ably and with the least degree of punishment in livyy weather. Pitching

and tolling are dut to the sudden immersion of extrain partions of a ship (fore ail aft or on either beam) dut to the action of the waves. This causes a temporary mere set of the displacement of the ship at the points aft cit with powerful lifting effects upon the vessel such as pitching when the seas are running fore and aft, and rolling when they are

McDong dl is the result of his experience in towing larges, had noticed that a deeply loaded large with practically no freebuarl rode yers steadily but that as som as the

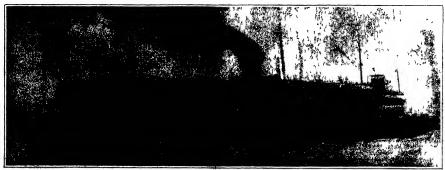
I ad was damped the vessel was roughly handled by the seas

amount of the short of the second of the short of the sho

the Christopher Columbias was built as 1892 and her to metricit in was ar markully rapid job. I ven for these divis it would be fast with. He carried was signed August 20th 1892 the first seriged of August 20th 1892 the first seriand the shap was latin held with builtra and machinery aboard De criber 3d a total of 87 days. He shap measures 365 by 42 by 25

oral of 87 days. The ship measures 365 by 42 by 25 ct.
The passenger accommodations are on the two upper

The passenger accommodations are on the two upper decks, which are carried upon six circular turrets or toward of atcil. In heavy, weather any sense that come aboard pass entirely a cross the ship. beh was designed to carry, 5000 day-passengers and at the Chicago lair carried a total of 1700 000.



The "Christopher Columbus," a famous Great Lakes steamer, built in 1833 and still in service
Dimensions, 866 ft. x 46 ft. x 35 ft. Pressuper associated by day 5,000. Speed, 50 miles. Bulls on the once popular whatback lines

## Inventions New and Interesting

A Department Devoted to Ploneer Work in the Arts

#### The Manufacture of (arbon Liet trodes

Till protect wak in this field v a gine by a 1701 from a care in at 1871. At that time the primary if in all was for use in electric at higher 11 she who prime to fit he in a france however, though this in the till beaugh the nuthreak of the warm 111. It is said. the muthreak of the war mitt to recidenment for special strate the one of cketri lurnaces i (i t Bitan ex-panded to a point who it shirtage of electro his was the hunting, fa tor the more so since I uglish d was to a large extent d pendent men loreign supplies of the materials employed in main facturing them

facturing them
As in well known electrodes for the
electric furnasis are of graphits or amost
phous asphon the former having this
higher conductivity and being the mere
expensive though the price even of the
changer electrodes of amorphous earl or
is now well pour 40 nounds were for us now well over 40 panada per ten While the electrode consumption of the modern furance in new ally stated an about 10 pounds for cash ton of a 1 produced it is a fact that the actual consumption meluding breskages av inges well over double the figure in its med. The conanish the figure in intimed. The con-sumption whin in lting brases for which purpose the chira brance her been tentatively used in the lburied series as only a small first in it files but a very tholess the rest of chiral view in in-portant figure of he to be not allurge. In the mis might flow in inless co-tensive commons is after control.

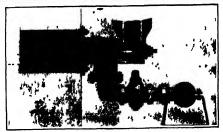
teamys equipment is often required for grading crusting tribing in le rening the new materials of chircost au thracite famp bis leritert circon tur and petroleum resultes a atomic graphate ate. After crushing the material is maked with the landing material usually tar or pitch and then kneeled in steam maketed miners. When mecessry cal emation to romove grace and only sub-

## Drill for Boring Square and Pat-terned Holes

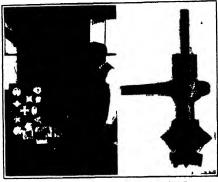
A COMMON method of borns, a square hole as wood as to have a rectangular cutter mounted on the bit so

bit into the world and rut out corners in the round hole I has is quite satis factory when working in wood of proper texture but in hard woods it is difficult to feed the rectangular out ter into the material. An inventor has recently over ing a bit with cutters that operate at right angles to the axis of the bit. These out instead of crushing their way into the wood

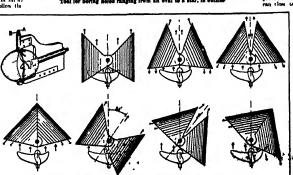
As shown in the view at the right hand side of the the right hand side of the accompanying engraving there is a cutter head mounted on the shank of the but which carries the lateral cutters. These out term are geared to the main shank is the cutter head in finaled with a handle by which it can be kept from which it can be kept from justed to any desired angle. This view shows a tool for cutting square holes and consequently a square out-ter head is used of a size



The fan-air burner used in the furnace for annealing carbon electrodes Air supply above, gas below



Tool for boring holes ranging from an eval to a star, in outline



Typical positions of the reversing radder & sheed (in per total properties and in diagram from above)
my for full speed astern (left below)
cost weareness, and for travel astern is

just large enough to hi into the hole bored by the main cutter of the bit. However other entire hands may also be used which are three sided or many uded and the cutters also may be varied in number the cutters also may be variety of pat-and form so that a wide variety of pat-ir ms may be cut, ranging froza an oval to a star in outline. In the view on the loft-hand side of the engraving are shown some of the possible forms of holes that can be cut with a bit of this type

## Reversing a Ship with the Rudder

Reversing a Ship with the Rudder THE can with what ships can but a control to the same of runn turns of mint easily consider in respectating engines, with turbines a special turbine must be installed for the purpose and the more maneuvaring power desired, the larger and more powerful and more expensive this turbine

I ven when all these arrangements have been made it is still not possible to give ships sufficient self-control under many illi unistances in which they find thousels es commonly placed. Tugs must be use I repeatedly, and the demand on those

vose is in all ports is great
in our issue of beptomber 28th last we to our seut of expinents r 28th last we showed a unique arrangement for setur-ing ny rang shifty. Instead of rever-ing ny rang shifty. Instead of rever-ing the engine in order to make the ship run backward titur, was a rudder so deigned as to these ra shout the propuler and assess the flow of water from the serve the so disctod that the ship would travil atom forement with the engine and resuming normally. A British inventor-nous noise foreast with what appears to be a more thoroughly worked out now must invani with what appears to be a more throughly worked out wrams of this sits. Instead of having he ridder it is to form of two compara turd's straight leaves which at best can only partially inclient. He servers, higher through the provides two tylindral leaves, higher through the provides two tylindral leaves, higher through the servers of the comparison of the servers of the comparison of the servers of the ser

The cas ntual parts of the rudder consist of the two curved defies tors. These are prootted at top and hottom on common on One is operated by me of a solid shaft, the o by a hollow shaft con trio with the selid By suitable mechanism

## Have You Tried Tuxedo in the New TEA-FOIL" PACKAGE?

It s soft and pliable decreases in size as the tobacco is used-tobacco does not cake in the package no digging it out with the finger Keeps the tobacco in even better condition than tin Now, don't you owe it to yourself to buy a package and give Tuxedo a trial?

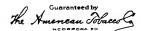
Not quite as much tobacco as in the tın. but -

MILLA+ The finest strongest ciga e e pape s n sli the wold Roll a Tuxedo cigarette with RIZ LA CROIX

> Finest Burley Tobacco Mellow-aged till perfect + a dash of Chocolate







## Recently Patented Inventions

Brief Descriptions of Recently Patented Mechanical and Electrical Desices, Tools, Farm Implements, Ele.

airpian may be distributed and observed at any ju vide a fits gate with guide means at the upper time irreque two of the direction of respect of the time for our several of the conditions which is considered to the several or either conditions with it would be sufficient to the several of the conditions with the sale but paide the fitting of the conditions with respect to the supportion in distribute of the conditions with the sale of the fitting that the conditions which makes the conditions which makes the conditions which makes the conditions which makes the conditions where the conditions which makes the conditions which makes the conditions which makes the conditions which makes the conditions where the conditions which makes the conditions where the conditions where the conditions which makes the conditions where the conditions whe

Pertaining to Apparel
CONVERTHIN 18 HER 18 AD BIREFCHES
DETONSER THE SERVE AND BIREFCHES
DETONSE 149 W. Libit. New York N. Y.
The first that relates to against not assess as were to women or gittle. It has particular reference to an inter-insured agarment for use are libit a a delte of waithup levels or as Bloomers or breed has An (ab) (1 is to provide frastening devices whereby in the transformation into the form of breeches the garment across the hips presents a wide military effect even though the skirt presents narrow hip lines

#### Electrical Devices

ELECTRIC FUNE F ! THERAUT 1246 Alabama N San Francisco Cal This invention relates particularly to a use in which a permanent holder is adapted to receive a fusible wire in a manner to permit of renewal of the wire as re-quired—so that except for the fusing of the wire maximer to permit of renewal or the wint as re-quired—so that except for the fusing of the win-the lift of the fuse may be perpetuated. An object is to provide a construction that will insure durability even under core sieve heat and rough usage and to insure the retention of the fuse

who is position
ELECTRIC LIGHTING SYSTEM FOR
AUTOMOBILES—I B Winner are light
AUTOMOBILES—I B Winner are light
Object of the investment in to provide an electrical
distribution system primarili. For automobiles
which includes allores aware or current a
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Invention
FIGE TOX — A A Wat is and II R Fire 4.4
High R E Debott Mich The invention has
High R E Debott Mich The invention has
It had possible to the property of the property of the
reasonal of the fuse without danger of shock
When the fuses have been replaced resilient
means serve to draw the cover into position where
it may be closed by a host with it also used to
open the cover upon closing the cover the fuse
are attentionally inserved in the order thus
are attentionally inserved in the order thus

Of General Interest
KIT FOR PLATE HOLDERS -F E Woon KIT FOR PLATE HOLDERS—F E Woon Box 172 Sanger Cal The object of the invention is to provide a device to be used in commution with holders for photographic dry plates for permitting the holder to be used with plates of



smaller sizes. The kit comprises a frame having one end slidably connected with the body of the frame to be pressed toward the other end the slidable end and the other end of the kit frame having leveled edges to engage over the plates

BNAP LOCK A W Presecut 207 Water St. Binghamun N Y The invention has for the object to provide a lock especially adapted for comesting the ends of sheet metal pipes and fittings or for locking a seam of any character wherein its arrangement is such that the soam can be loatanily and permanently locked without the use of tools and without the necessity of soldering or atting down

soldering or artifing down.

FNYEJOP — i Ilnyas and O Il King-ravinca 1940 Hernard Ave Los Auguste Cal-The invention railant to envelope for second class mailine matter and is particularly adaptable for use i) basiness from has inge-branches in different (titles such as insurance and railroad companies making, in prosibility in use the enveloper companies making, in prosibility in the developer and rows marin. Worlder is to provide a very second of the contract of the contract of the re-sidence and the contract of the contract of the re-sidence and the contract of the contract of the re-sidence and the contract of the contract of the re-sidence and the contract of the contract of the re-

Permit ing to Accommentate

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SHOWING THE LOWER PART OF STAND PIPE AND OATE IN ELEVATED POSITION

automatk manner. A further object is the provision of a stand pipe and a drain off pipe together with a wedge-shaped gate, which when raised will leave in opening for starting the flow of water and

MEANS FOR FORMING CONCRETE
PILES —M MILLES 486 E 188th St. New York
N Y The invention has particular reference to N Y 1 he invention has particular reference to means or included of forming concrete piles either with or without metal reinforcement, with an enlargement either at the lower end or at some point above it forming a footing or pedeatal to increase the stability and the efficiency of the pile when built or sunk in soft earth

pile when built or sunk in soft earth
FIRE HYDIANN — R I THORNE and F J,
Millar Williamsport Pa An object of the
invention is oprovide a five hydraul of the header
out-off type wherein the main raive the main
threat on the state of the state of the
tamp the state of the type and the
top the stand pipe or barral of the hydraul
having a bore of such a construction that there were
no inwardly projecting parts to obstruct the
removal of the machanism

DRINKING CUP -V E FRENCES FORM Texas The invention relates to drinking ex and holders therefor the object being to provide and holders therefor the object being to provide a small holder in the form of a case arranged to be conveniently carried and to hold and protect a paper drinking cup or holder of other material capable of being made impervious to motature and of a foldable nature adapting the same to opening and collapsing movements and closing of the case

and closing of the case
SOUND TRANSMITTINO DEVICE.—E
CREAR 1885 11th 8t. Oakland Cal The invention relates to a sound transmitting device
adapted to be carried in a partially deaf person
for enabling sounds to be hosted. The general
object is to provide a device which is extremely
sensitive to secure and also adoutable as to
sensitive to secure and also adoutable as to
the left in the count and also adductable as to
the left in the count and also adductable as to
the left in the count and also adductable as the
third in the levent about by a disphragan chamber.

Hardware and Tools
TOOI BAG M Missan and H. GOLDING
care Kilanger Corp 135 Breadway, New York,
N 3 The object of the invention is to provide
a tool has more especially designed for the use
of sincal men in the army repairers of machinery
jumbers and other person and arranged to
possible the totally carry the bag without
possible to readily carry the bag without
colors in the points of the tools in party within
the points of the tools in party carry
ther of the bag. The bag is carable of provide. ries of the bag . The bag is capable of rough

COMPANIES OF THE PROJECTION — V CLASS Address C A. Finish insister 450 4th material being vulcanized the pressure of the product of the produ

PIPI REAMEK—T P SALLEY CAPE R A Robam 112 Clarkens St. Brooklyn N Y Among the objects of the invention is to provide an apparatus in the nature of an attachment for a standard type of pipe stock employed for the cetting of a thread on the cutded or the end of a pipe the attachment providing a simple means for insisting the end of a pipe ready for coupling and the possage therethrough of electric conductor writes or the like without observation.

## **Reating and Lighting**

Reacting and Lighting
VAC UM MONNET — II Borp, 142 å
13th vv. Mr. Vernon N Y The invantou
relates to locating appliances and has for tex object
the provision of a removable bonnet or cap for a
realities valve formed with a spring assed structure wit is will become unesated for releasing air
when it is found presenter beings the air under
presente into it will automatically reseast itself
when it is found presenter beinge the air under
when its found presenter beinge the air under
when its steam presenter basic ent related Machines and Mechanical Devices

LACGING STRETCHFR —J W BULLER-Hillshon ) Kans Among the principal objects which the invention has in view are to facilitate the installation of a facing logging on pulleys or similar mechanical ek menta to permit the operation of faing or covering a pulley without removing the same from service and to provide portable apparatus for accomplishing the above stated object

BULLING OR POLISHING WHEEL BUFFING OR POLISHING WHEEL—A Luwers 11% Whith K new york, N Y The inventin relates to buffing or polishing wheels made (\* c) ofton would leather or other material 12s object 1s to provide such a whoel arranged to prevent the lose of the material of which the wheel is made and to permit of using the wheel until the material is worn away pracelauly down to be made to the sum away pracelauly down to provide as best which must handler object is to provide as best which must handler object is to provide as best which must be to the control of the conminimum amount of material

MENT RING DEVICE -W J BRITTAIN Boldenville, Okla The invention has for its object is provide mechanism for measuring liquids as for instance gaseline wherein a storace lank is provided an air chamber and a



PH NT YIEW OF THE DEVICE WITH PARTS IT

that the flouid may pass from the ste to the measuring chamber and be discharged therefrom and wherein a single valve is provided for controlling the movement of the liquid

for controlling the movement of the liquid
Al TOMATIO CHAIN-BELL-MAKING
MM HINE — J CHOY = 2732 Duvens 8;
I length Mo The invention raises generally
the limit of the limit of the limit of the limit of the limit of the limit of the limit of the limit of the limit of the limit of the limit of the limit of the limit of the limit of forming the liquid 
#### Munical Devices

Measical Beviese
GRAPHOPHONE AND DIRK ERCORD
ROI DEE — J Harrana Nome Territory of
Alasia. The object of the lavancium is to provide
a record holder in which the records may be oppserily and socurely stored and kept, by which the
removal of more than one record as a time is
provented and in which a record case reserved,
must be replaced before another can be taken out,
and in which by mease of a lever statichnessed also

Prime Movers and Their Asse Frime Movement and These Assumerous

SPARK PLUG — F F Tennason, 5346

Everett Ave, Oaldand, Cal A specific object
of this invention is the provision of a spark ping
which is formed with a head at its issuer and that

#### Railways and Their Ac

LEG REST -- J C BRUNGARD, 465 E. 56th Si North Collister Wyo The object of this invention is to provide a device especially adapted NI North Collistor Wyo The object of the invention is to provide a derine especially adapted for use in railway ones, to be extraged between the seat of one chair and the footress of the adjacent, to provide a rasi, for the legs, wherein the rest is expathle of being fielded into small compass and whose settended offers a wide compass and whose settended offers a wide companion.

MOUNTING FOR FRONT WHEELS OF TRUCKS—J C SHELLER AND R. B. AUSTIN, 310 Marble St., Caddlac, Mich. An object of the invention is to provide a mounting for the front drive of a vehicle which will be simple and which orrive or a venices which will be simple and which will give a resilient connection between the mounting and the truck frame. With this device if any object strikes the front har obliqualy the tendency of the mounting would be to move on its pivot thereby reducing the impact.

pibot thereby reducing the impact

HRATER—H F Korn, 80 Church St., care

Köhb Portable Bidg Co, New York, N. Y. The

object of the invastion is to provide a besite more

stoperally designed for use in garages and are

staged to beat the reddate of an automorbide to

provent freesting of the water during cold weather

Another objects is to provide a heater which, when

installed in a parage complies with its rules of the

meaning a parage complies with its rules of the

first underwriters

RELTATTACHMENT FOR MOTOR YEHICLES - F R Wames area, 728 50 oth 8t,
Ralina Kana an object of the invention is to
provide a strong and inexpensive attachment
and which takes the place of the orank and can
be used in a manner similar to the orank and can
be used in a manner similar to the orank Another
object is to provide an attachment which will not
interfers with the valide and will allow the use
of the velicle with the statechment thereon

WHEEL CARRIER FOR DEMOUNTABLE WHEELS -W F WARRISHBROUN, care Ford Accessories Co. 585 Jackson Ave. Bronx, N Y. Among the principal objects which the invention Among the principal objects which the invention has in view are to provide a support fire spare wheels on automobiles and particularly on the automobiles of the type known as Ford "The currier is provided with a hab journal block, which is a staiped to 6 fit the journal opening of a de-motion of the provided with a state of the car-ticular than the state of the car-ticular than the state of the car-ticular than the state of the car-

the running board or the rear of the our INDICATING VALUE—0. A Howrs, Port-land Ore This invention has for its object to provide a value adapted for use in passurated three wherein indicating mechanism is provided to show the pressure establish in the interior of the tirs, and without the necessity for uncoupling the pump or all connection to assertian such the pump or all connection to assertian such that the pump or all connections and preserved. The where it and/explaintering numerical the three preserved in the three p

#### Beech

DESIGN FOR A FLAG, PENNANT, SIGN, EMBLEM OR ARTICLE OF A SIMILAR NATURE —O F SELLE, 2848 Oregon Ave. 84 Louis, Mo

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is pench and da, jig and fixture work Balary \$50 to fee
week, Write W E B Room \$600, 110 West 600
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## A Car-Loader That Automatically Weighs the Load

OUR cover illustration this week illus trates an interesting system of trans-ferring materials from ship to freight car located at Locust Point in the harbor Baltimore Here there is a pier 800 f Baltimore Herr there is a pier 800 feet long, on which there are three tracks The center track is provided with a conveyor belt 30 inches wide which extends the antire length of the pier. This is driven by a motor located in an operating house at the land end of the pier. On this central track runs a loading machine and a series of hopper cars. On each side are tracks on which freight trains may be run to be loaded by the loading machine Heretofore it has been cust mary to move cars up to the loading pastion, but with the present system the loading machine travels along the line of cars and will deliver its load to any desired one. The hoppers are loaded in the usual way from vessels or lighters and they have a capacity of 20 cubic yards of material. This material is delivered as required to the conveyor belt

The loading machine is provided with 20-inch belt conveyors which pick up the material from the main conveyor belt, pass it through a weighing machine and deliver it to a loading arm which in turn delivers
it to the car The loading machine will it to the car. The loading machine will operate to load either an open or gondola car or a box car. When the loading machine has but moved to a proper position, the loading arm is introduced into the door of the car and then may be swung to any desired angle to deliver its load. The loading arm has a horisontal travel of 270 degrees and also can be moved vertically so as to be raised above the

highest open car The entire operation is under control of the operator located in a cabin on a loading machine Power is supplied to the ma chine by means of wires strung along the bulkheads, which separate the middle track from the outside tracks. The hopper cars are provided with motor drive so that they may be moved to any desired position. With this equipment, bulk maposition With this equipment, bulk ma-terials such as ores sulfur clav, coal, etc may very quickly be transferred from a vessel to a freight train. With this loading machine box cars have been loaded in ten minutes and goudols cars in less time One of the most interesting features of the system, is the electric weighing apparatus details of which were published in the SCIENTIFIC AMERICAN of August 10th

Our Navy's Bid for the Great Trans-

Atlantic Flight (Continued on page 479)

ctically the same as those given for the NC-1 However, aside from being fas these more recent boats are ren climbers, being able to make 3 000 feet in less than 10 minutes Depending on the load and other conditions, they can take off from 30 seconds to slightly over

minute It is interesting to study weights in connection with the attempted flight connection with the attempted night.
The total weight of the more recent NC
planes is about 16 000 pounds. The gas
and oil for the great flight wrights 11,500,
and the erew of five about 900 pounds.
The total useful load possible is figured at The total useful load possible is figured at about 13,000 pounds giving a gross lead of 29,500. The limitations of the load has led some Navy men to conclude that the Asores route from Newfoundland is practically the only one available, although nothing has been officially said about the The distance from Newfoundi matter The distance from revenuessage to the Asores is some 1,200 miles, while to Ireland the distance is 1,760 miles At a fair rate of speed, the flight to the Asores should take about 17 hours, while to Ireland it might take 27 hours. Now to are and it might take 27 hours. We then, the four Laberty engines require \$80 pounds of fuel an hour at crusing speed, which on the Asores course would mean about 11,050 pounds, and on the Ireland course, 17,550 pounds. For a non-stop



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The SCIENTIFIC AMERICAN has for many years had an office in the Peoples Gas Building This office will now be transferred to the Tower Building and will be consolidated with the new office of Munn & Co

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## MUNN & CO

Patent Attorneys Woolworth Building 233 Broadway New York City flight is tween Newfoundland and Ireland it would require a gross load of 3.550 pounds which is convicted by by and the separaty of the Newford Newford Buyend the separaty of the Newford Household Buyend the separation of the Newford India and the Australia of the purpose of recharging the fluid tanks, the Newfoundland to Ireland course would at once it a sample matter in so far as fuel is pound.

colling and the state of that the trans-thanto flight will be undertaken by three Navy planes the N.C.1 N.C.3 and N.C.3. The N.C.1 we persist of the state of the trans-thanton area of the state of the trans-thanton arrange in tendent pairs proved unsatisfactors out than been demanted in factors of the state of the s

The me advantage which the small Sopwith and Martynaide machines possess. name! thility to get to the starting point first | | | getting away at the earliest possell moment appears to be more or less gone ) vitiat the U.S. Navy has its luge NC 1 is about ready. And when it NO 1 1s about ready And when it com st rrace between the small and large macha < everything except speed is in favor I the later And in a contest of this kind ped is not the first consideration for it vill be a truly remarkable achieve-ment i the single engined planes succeed in I lig the ocean crossing. On the other band the large Navy planes with at least 1 engine of each plane in reserve in event 1 ngine failure have everything else i if it favor there will be no navi gati ) I difficulties even if dense for is encert tied because of the directional wir I s and the string of ships along the I lp will be available at any point alor at 1 route the multiple engine como me t Il naure rehable performance and the pit that body if the neer if will I landing on a fairly rough sea and malay by necessary repairs

1) by this trans Atlantic flight compa

1) is the trins Athanta flight compatits 1 s an wesslowd stieff and a content but sportsmen on the one hand and cuts so on the she is the first depend on 1 i more than anything else the set 1 is pred on preparing for all conting, i.e. But even with the most bir of preparations such as our Navy 1 i iii 1 out the attempt is still to the distribution of the still the probalified in and much still kepinds on what we replaced to call luck, for want of 1 it it would

## The Tank Man's Story

(( runned fr m pag 48\*)

has sals they run. You can crawl over a 1 st ph pole and havilly feel it is well well utilities. It is not the sping supersoon the rist in 6 rollers claim the and track will be also figure from the sand track will be also figure from the sand track that I will be don't to keep you will find a 1 feet in the don't to keep soon one first is willing the all throwing a greened for the sale of the sale of the sale of the will be well and withing that in the finding and it is applicated to the sale of the sale and it is applicated to the sale of the sale of the best of the sale of t

In the condengered any one's eyes

( iman tanks? Punk Too sliv

in linism too exposed too many slits

Ol xr well made, but poor design

N r l I think very much of German tank

We had about 44 per cent casualties and that covers 22 actions len per cent of it casualties were deaths. But 1 don't re ill many men dying without doing scouthing first

I recall that there was one tank got stul in a trench and noblung handy to ray it Captured, of nourse Well, we pured to back two days later Every round of ammunition was fired Every round of ammunition was fired Every protice cartridge had been fired And both men had been wounded long before they were killed, there was plain wedness of it in blood where no blood would be if they had just been anuffed out right at first Day must have put up a beautiful serap Ammunian South ilke to surrender, some





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#### Free as Air (Continued from page 464)

such numbers to be recognised. Yet flying high is the greatest asforguard an avastor has Apparently the solution of the problem is a preseribed course for arpianes between any two points and yet this has difficulties, since wind and fog might casily make a plane fly out of its course No law holds the individual responsible for those things he compelled to do by the affixed to the operator of autrafit which loses some part of its mechanism when driven over a residence by a storm, said part of the mechanism doing damage below?

In view of the hundreds of legal questions here but outlined some attempt at settlement should be made at once It is not a matter for legislation without invatigation jet such an investigation can hardly be made authoritatively by private organizations without governmental cooperation and sanction

The encopyment of covhisation has been assentially the dow hopinin of transportation. In a simple consistency of the consistenc

thereme in time between two man down than train automolic public road and than train automolic public road and the second of the

The economic tuture of the world may well depend upon the development of avaston Arn we going to be short-sighted enough to let our part in it like Topsy 'just grow or will we take action in time, and see that our legal enactments and control be such as to lurther and not hinder the progress of that art-sensee which holds no little promise for the apread and increase of civilization?

#### Shale Oil as a Business Proposition (Continued from page 484)

To the Trade:

sales policy assures both jobber and

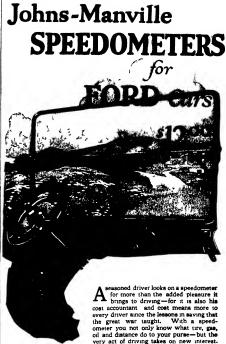
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There will be ammonia and pot sich from the renduce And then will be other items, but as to just what they will be and how much of them will be recovered, no two authorities agree I stimates of the aggregate value of all products run as high as \$15 \$20 in one case even \$15 per ton of raw shale—and as low as \$1 per ton Cost estimates range anywhere from \$1.26 to \$10 per to \$10 per ton \$1.26 ton ton \$1.2

The shale industry has been demonstrated as to proves values and profits, in Scotland these many years but that doesn't prove anything about the United States. We do not yet know how our shale compares with Scotlands. We suspect that much of it is richer in oil but it may, be found learner in other product is that go to make up the profits. I hen mining out that may be found learner in other product is that go to make up the profits. I hen mining out for the profits in the two brought up to the surface our has to brought up to the surface ours has to be blasted out of immense cliffs. On the face of st, ours should be the cheaper process, yet our may well doubt that we shall be able materially to reduce the Scotch mining costs of 40 cents per ton, and after we get the shale out of its bed, our costs will be greater.

All this goes to show two things. It goes to show that, in the first place, the



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the error was to a regard had a chimate water factor MASON'S NEW PAT. WHIP HOIST strigger hoists Faster than Elevators and hoist from teams, flaves handling at less expense fastured by VOLNEY W MASON & CO has. Providence R 1 U S A.

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testify that there is money to be made in bestify that there is money to be much in the laboratory, but the men who make it are the ones who finance the laboratory work and not those who supply the raw materials. In turn of the latter comes only when the processes developed in the only when the processes developed in the laboratory come into the general market for the use of everybody either through heens or expiration of patents Nobody is a nut to get rich because he owns oil shale lands, until after the chemists and the engineers have finished their end of the contract—and to date they have har ils begun

the second Q E D of the oil shale in lustry is that it is a big man's game
that are no gushers here that hring in
milli ns in a few weeks and there are
no liy holes that eat up the money without giving the investor a chance of return pi ps (or s game, it is not a game for the man with a home made plant working on a small scale. It is a big manufacturing proposition, involving plentiful supply of raw material, plant operation on a large scale and marketing problems. It is a prehiminaries have been closed out invest inillions to get back a reasonable return and a sure one. It is no game for the little fellow and the only place where the little fellow can get in ou it is by buying and holding shale lands until the big fell m is ready to buy him out

Another thing-shale oil is not going to Another thing—snale oil is not going to run the oil-well man out of business—at least not in this generation. The quantity of oil shake exposed on the surface and easily accessible is practically mexhaustible. There is enough in the four states nienthe control of the raw shale that can be treated for the next contury. But take the most optimistic cost figures that have been presented, and stop to reflect that to get a shale-oil production equal to one-ninth the present output of the wells would call a capital investment of \$30,000,000, while under the least favorable estimates. this production would necessitate the find-ing of \$250 000,000 We shall not get the technical problems of shale distillation wouled cut, and we shall not get our capitalists convinced of the practicability of the shale-oil business on any such scale

of the Shate-On Duminos as this for many years
I he true status of the shale industry may
be centical if we look carefully into the
attitude of the Bureau of Mines The impression seems to have got abroad that this Bureau is in a state of roaring optimism regarding the immediate prospects of the slak deposits as a millionaire factory Nothing could be further from the truth The Bureau has deliberately refrained from 1980ing reports upon the various methods new known for recovering oil from shale, simply because so little is known in this country on the subject Moreover, the Bureau, when it has had the opportunity to advise investors contemplating en-trance into this field, has always pointed out that the industry is in the experimental

age On the other hand, the Bureau is properly primistic with regard to the ultimate future of the industry. It has, through one of its engineers been lending technical assistance to the construction of small apermental plants at various points has two engineers engaged in studying the e possibilities in this country, and the Scotch industry in considerable detail The final word of the Bureau, is that

incipient boom in oil shale properties which is now under way in the West is one calculated not only to lead to considerable direct loss, but equally, through under-mining of public confidence, to serious delay in the progress of the industry

## Our Marked Highways

(Continued from page 487)
oither side of the track. In riding into
a Missouri town on the Pike's Peak Ocean-

American oil shale industry is still in the to-Oesan Highway we found that our experimental stage. Now there are a lot of American manufacturers who will for natives to be abroad, so, mindful of the usual amail-town custom, we yearbured to turn tothe left and drive through the village along the man street Finding ao guid, marks to be picked up when we got out of town, on the other and, however, we returned and there was our original course plain as day, to the right and across the railroad tracks When we were there the first time a long freight train had been halted at just the right spot to hide the marker beyond A marker close to the track on our side would have obviated the difficulty

#### The Seagull Flies (Continued from page 489)

There is another very important member of this aerial ships crew The observer sitting in the little cockpit in the very nose of the plane, surrounded with all manner of strange looking instruments, has quite a few duties to attend. He is a radio operator and can send and receive radio messages to and from his station on shore He makes known his position from time to time and reports mivthing sighted interesting or suspicious nature. It is he who trains the bomb sight on the enemy submarine the sight automatically indi cating to the assistant pilot behind, the proper moment to release his bombs proper moment to release his bombs. In some cases he has a Lewis gun or a Davis non-recoil gun combined with a Lewis gun tracer mounted on the scarf-ring around his cock-pit This latter contrivance is very ske splashes in the water about the target make splasnes in the water about sue target, and indicate when the gun is pointed directly on the target for a direct hit. When the Lawis gun builtet are hitting the target the Davis gun is discharged and a fair-sized shell finishes the job. This combination doubtless accounted for quite a few

German subs The big factor of all aircraft is the motor The big factor of all aircraft is the motor. In the event of moto trouble the land file is always assured of a place to land. He may land in a tree or in a plowed field, but he usually comes out of it all right. His worries are over when his feet touch the ground. The may all fire it has another element to contend with the sea. Even the different took of the different head with the sea. element to contend with the see Even if he does not crash on landing in a rough sea the prospect of diriting about, pitching and tossing for hours perhaps days, is not one to look forward to with any amount of pleasure A flying boat on the water does not make an object easily seen or distinguished, expocally if a sea is running Ihe chances of boing picked up, if far at sea, are prefix slim. The chances were son, are pretty slim. The chances were much better in the submarine sone abroad than in home waters Submarine patrol was far more risky on the American coast then far more risky on the America.

The submarine sone fairly swarmed with craft

At home

marine sone fairly swarmed with erats hunting for the Bothe serpent At home the ships were few and far between Many tales are told of long drifts in awreked plane before reseue eams about It is nothing like drifting in an open boat The open bust as at least designed to withstand a sea the flying boat bull is not the state of the Its one-eighth-inch planking does not held together long, especially if subjected to a bad landing. The water soon finds its way into the cock pit for the filers to slock around in until rescued. It is usually the airfilled wings that keep the wreck affoat

These pages could be filled with tales of naval pilots drifting helplessly at sea for hours and days until picked up by a steamer nours and days until picked up by a steamer or subnarran chaser. In many cases the pilots were obliged, on being picked up in southern waters, to take involuntary trips to the north, or vice versa. They would be taken perhaps thousands of miles from their home station, not being able to get their home station, not being and to get usabore until the next point of embatkation was touched by the boat I remember one case in which so many of these ocean trips were figured in by the same pilot that a suspicion was raised on his station as to whether he did not take a keen enjoyment in these imprompts ocean voyages and used them to vary the monotony a naval aviator's existence

There is no sarcasm in that expression the naval aviator's life is indeed inonoto nous even his flights do not give the thrill that is supposed to go with flying for hours in a grey void if the weather is loggy or misty, the water scarcely discernable and only distinguished by the breaking crests of white caps If the weather is fine the horison ought to be and the grey merges into the greenish-blue of the ocean Sel-dom are the days when the line of the horison is clear and sharp. About the most interesting things to the pilot are his instruments arrayed on the dash before

A passing ship breaks the deadly same-A passing sinp breaks the deadly same-ness Flying low you survey the deck and peek into the port holes. The crew and passengers rush up from below and wave you a greeting. Great is the temptation you a greeting Groat is the temptation of a forced landing and the ensuing ocean

Or you come upon a convoy starting Then, indeed, you have something to look at There is something, enough to still the most sluggish spirit, in the spectacle of ten or fifteen transports fringed about with bristling cruisers and with destroyers darting about like minnows playing around a school of larger fish Each craft leaves and fading into green again. The convoy has its special detail of many planes and 'blimps" Their eyes will take care to a sinking in the face of all this protection We are out for the raiding sub that prowls up and down the coast looking for no par-ticular prey but destroying anything that could be called a ship and having for an object the terrorizing and weakening of the morals of the people at home

True it is, few are the subs you do sight Your heart gives a thump as you sight your first one Carefully you steal upon it and already you see headlines in the newspaper and a-war decoration he would dive and wonder why he does not ne would dive and wonder why he does not tall the st make an attempt to escape. Now you are on it, one well-placed bomb will do it. But wait, not so fast. See those markings Disgustedly you swing back to your course Instead of detorations you see headlines and disgrace for sinking one of your own submarines

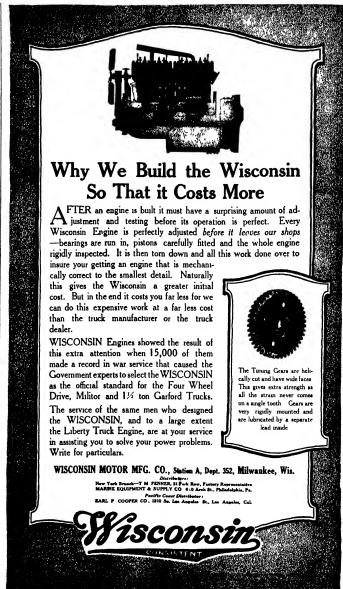
But even though you do not sight enemy undersea craft, they may have sighted you while they were in the very act of creeping upon their unsuspecting victim Your very presence has averted a sinking How often did the entry appear in a cap-tured submarine's log "Hostile aircraft tured submarine's log "Ho sighted Forced to submerge

## Recent Novelties in Public Speaking

(Continued from page 489)

cable, and all the wiring leads to a central point where the necessary connections can be made Thus a speaker either on one of Thus a speaker either on one of the stands on Victory Way or in an air-plane several thousand feet aloft, can address the thousands of porsons gathered along the avenue, through the battery of

loud speakers
Vacuum-tube amplifiers figure largely in the operation of such a vast number of loud-speaking telephones Each amplifier unit is nothing more than an incande lamp of very much the same design as those used for illumination, but is provided with two or more electrodes inserted in the bulb along with the filament Such an arrangement constitutes a very delicate electrical relay, that is to say, a very weak electric current may be used to modulate or affect a far more powerful current, thus building up any weak current to any desired strength. In fact, such amplifiers are used in long-distance telephony, one amplifier being employed for every 500 miles of transmission. By passing a weak current through one amplifier circuit, and permitting that are uit to affect a second





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n igine sound amplification carried to that gree yet it is regularly done

m airships and airplanes, Victory Way irr ats induced in the serial are led to a ircless receiving at which, in turn modu t a the loud-speaking telephones through it ulti step amplifier. The same equip int has been readily employed for receiv g speeches from Washington Clicago or ther critics within ordinary telephonic umunication of New York City

## Reversing a Ship with the Rudder (( misnued from page 492)

ine as great as 30 per cent. It also since that in starting the ship from rest re will be a flow of water over the rude ving steering power before the ship has ı u lı wav

the power of the rudders unaided to irive the vessel astern without reversing engines renders it possible to dispens with all other reversing mechanism tingency of the rudder a being out of ii ii issuon need not be provided for to the

r rang sinco with the rudder inoperative
it vissel is helpless anyway in reir sting eignose this means that the link
i from reversing eignie and astern guides
be left out while with the turbine
alliation there is no need to fit astern tirlines. With oil engines the reversing

p ration of the reversing mechanism I substitutes or rtainty therefor

He rudder here shown has been thor add, tried out up to 150 horse-power by Buttish Admiralty and others Extentrials have shown that there is no loss spiced shead in boats thus equipped e speed astern is about one-third of that it bump perhaps a trifle less than the tri speed ordinarily obtained by re-

### Fffects of Attachments on Quality of Work and on the Draft of Plows (( mitinued from page 490)

There are few times when a plow either alking sulky or gang should be used utlout the jointer It is deudedly essary in plowing sod Some farmers be gained the impression that a rolling litter takes the place of the jointer. If the new the place of the jointer it is an it and cannot do what the jointer is a decided by in turning under trash it effectually it vants the growth of grass between furew shees and it leaves the ground in irr w sinces and it leaves the ground in Ital condition for other tillage tools one claim that the use of the jointer saves e harrowing In addition to these uefits it decreases the draft, as the Lures show

Various types of outters are used on wilking plows They all assist in making lean cut furrow bank possible and the of many of them results in decreased

s of many of them results in decreased traft. I he rolling coulter is most generally at lon sulky and gang plows. Although the figures herewith given show that it in reas a the draft its use in cleanly sutting for the furrow shee and in cutting through trash overcomes any disadvantage due to kerneter draft. Manufactures of plows invest invariably equip their sulky plows the sulky of the sulky plows the sulky of the sulky plows in the sulky of the sulky

to ust, which in turn affects a third circuit and so on, the weak current can be made do moditate aloud-pasking telephone in unto almost any magnitude. Come coulter, and the combination coulter and microil averty amplifiers are on regular construction of the day of the coulter, and the combination coulter and the amplifiers are on regular construction of the day of a subly piber East series in the average of 10 sects. To the inegablorhood of 1000,000 times 10 in the layman if in practically impossible to of 40 tests. The tests were all made in of 40 tests The tests were all made in clay learn soil which was covered with rank growth of timothy All condition were made as uniform as possible Th figures represent the total pull in pounds. Not all furrows were of exactly the sam Not all surrows were of exactly use sain size In order to have results comparable therefore it was necessary to reduce a pulls to pounds per aquare inch of furrow slice that is the total pull divided by the cross sectional area of the furrow. The figure was then used in connection with a pure was the pure was th

common furrow eight inches deep and 14 inches wide in order to have all pull-comparable The average furrow cut was approximately of these dimensions EFFECT OF ATTACHMENTS ON THE DRAFT OF A SULKY PLOW

| 1  | Prow ATTACHMENTS |      |         |                    |                                          |
|----|------------------|------|---------|--------------------|------------------------------------------|
| Be | ries             | Bere | Jointer | Rolling<br>Coulter | Com-<br>bination<br>Coulter<br>& Jointer |
| 1  | 1                | 628  | 684     | 707                | 769                                      |
| 1  | 2                | 647  | 580     | 668                | 795                                      |
| 1  | 3                | 616  | 608     | 668                | 805                                      |
| 1  | 4                | 649  | 595     | 682                | 725                                      |
| Am | ***              | 635  | 610+    | 685                | 786                                      |
|    |                  |      |         |                    |                                          |

### The Manufacture of Carbon Electrodes (Continued from page 492)

stances precedes this step. The mixed material is then pressed, sometimes in ex-tremely powerful presses to the size and shape desired in the finished electrode. There follows a haking or rosating of some surt to drive off the volatile elements and reduce the mass to the carbon form sought

Although amorphous carbon elec have for some time been obtainable from non (a rman sources, their manufacture has presented some few difficulties. In order to avoid ruinous local stresses, the work calls for extremely uniform tempers tures throughout the heating chamber, tures throughout the heating chamber, temperatures varying from 450 to 600 degrees cantigrade and these must be maintained for such long periods and with such accuracy that the use of any other than a gaseous fuel se out of the question. We have been shown a furnace developed for this work by a leading Britain firm of heat engineers. This furnace is installed in a large Midlands steedwork, with an output of 30,000 tons of electric steel ner very 11 as constructed of a steel ner very 11 as constructed of

steel per year It is constructed of a special refractory material with walls nine inches thick, bound by channel irons and tie rods The heating chamber is designed to accommodate six electrodes at a time of any size up to 22 inches in diameter. The top of the furnace, or cover-plate, is of of box section and serves as a preheater for the arr supply taken in by the burners The latter as will be seen in our illus-tration, are of the fan-air type, for consum-

ing town gas at a slight supplementary air pressure of about six inches water column It will be seen that the mossie, the part that in any type of burner requires most fre-quent renewal, is formed of a refractory quent renewal, as formed of a refractory block, which can be easily and cheapily replaced Each of the six butners at-tached to the furnace has a 1½-ino has supply pipe and a 2½-ino har supply, separate main controls being provided for both gas and ax, while the permanent sir rate of the butners can be adjusted by the permanent of the regulating plug manufacture of the permanent of the permanent sir the furnace firms into combustion shows is used it should be the jointer, except Three burners are placed at each side of mider numsual conditions. The ideal combination is the coultries and jointer These may be used as separate limited in the properties of the heating the same desired in the properties of the heating the same desired in connection with tractor plews, but is used in the properties of the prop



Cuti

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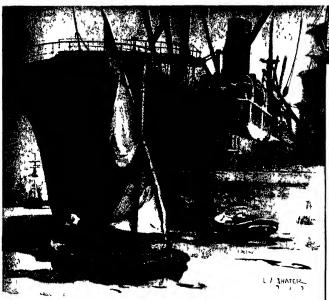
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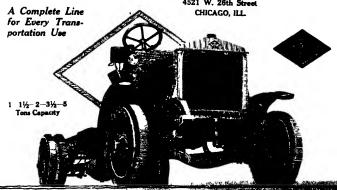
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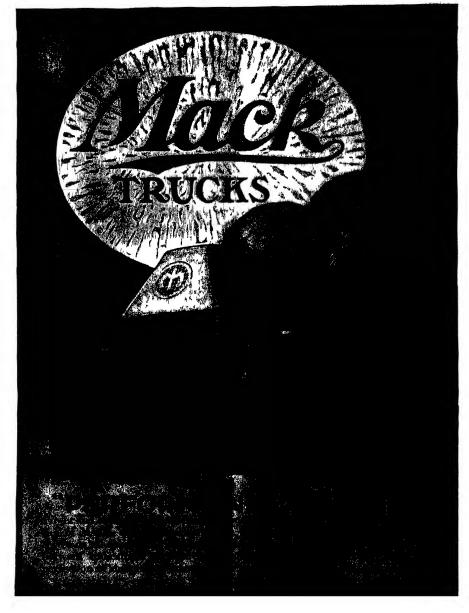
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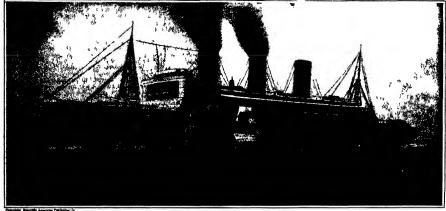
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# THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX

NEW YORK, MAY 17 1919

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The first vessel to use steam in crossing the Atlantic, contrasted with one of the typical ocean giants of today

### The Pioneer of the Trans-Atlantic Liner By Robert G. Skerrett

By Robert G. Skerrett

W HILE the blue ribbon of trans Atlantic possenger
flag, credit, neverthicles, for others, the relation of the relation of the relation of the relation of the relation to between the United Vistees and Europe belongs to America One budnered years age on the 24th of May, the steamer Savannah rikared Tybee Ge, and started upon her memorable voyage to Liver pool it was the ambition of her owners to establish a fast line between the port of Vavannah and Tragland and by qualifying relance upon the changeful winds to make it practicable through the ageincy of steam machinery, to forge steadily onward despite calms or opposing galles

opposing gales
That radically ambitious scheme was the outcome of
the steadily widening scope of our domestic steamboats That radically ambitious scheme was the outcome of the steadily widening scope of our domests of steamboats which traversed the land-locked reaches of our invers or the schelered waters of some of our lakes and sounds it was also promoted by the local pride of certam Savan-nah shipowners, Mears Searborough and Isaacs, who ballewed that, through the adoption of steam they might outstrip New York in the field of foreign trade The man directly responsible for this courageous vonture was man dreedy responsible for this courageous voture was Capit Moses Rogers, a Connecticut mariner of repute who had become familiar with the engine affeat by association with the steamboat undertakings of Robert Fulson and John Stevens He it was who induced the Savannah shipowners to buy the vessel when she was nearly ready for launching and to fit her with auxiliary

The "Savannah" was built in New York at the yard The "flavannah" was built in New York at the yard of Crocker and Frieckt, and was planned to be a full-rigged ship. The sprint of her was unchanged with the exception of stepping her manimate somewhat farther aft in order to provide space amidality for the installing of the bolizes and engine and for the stowage of ocal The flushing arrangments were for 75 tons of ocal and cor-cords of kindling wood. It was bettered that these

ould suffice to carry the vessel a ross the Atlantic and would suffice to carry the vesset a ross the extended as evidenced how little general information was available a century ago concerning coal consumption. In fact as late as 1844 data furnashed by McCoregor lard the founder of the famous Birkenhead firm informed a commuttee of the House of Commons that engine so fless committee or no rouse of Commons that engines of less than 120 horse-power would riquir 105 pounds of roal per horse-power per hour At that rate the Savannah should have had a steaming radius of about 175 hours or a little more than seven days but she fell a good deal short of this

around so a inter mer chain seven days but her a good deal short of the again I util by Nephen Vall at the Special Vall I now Works, near Morratown N. I was rated at 80 horse-power and was 1 the nelined direct acting low-pressure type, with a cylinder having a diameter of 60 makes and a artick of five feet. The principal stumbing block to outfitting the craft was the boilers of which she carried two Those actually laced in the vessed were constructed by Daniel Dod of lize both, N. J and were not accepted until after a craft other had been rejected. Contingoraneous rate special, that the steam generators were to work at full support, the steam generators were to work at full named by a mercury page. While the log of the "Savanush in nowhere tetla how fast she was able to run under her engine alone it was reported in one of the New York, payer in the later part of March of 1819 that, during a steam trial in that port decoursed the title of the covered a total distance of 10 miles both with and against the titles in a interval of I hour and 50 minutes of the covered a total distance of 10 miles both with and against the title in an interval of I hour and 50 minutes of the covered a total distance of the covered a total distance of 10 miles both with and against the title man, the shape here eight days out from

On the other hand, the ship when eight days out from Savannah and bound for Laverpool was spoken by a sailing vessel, which reported that the steamer at that

time was making between nine and 10 knots an hour-she was probably using both steam and sail On the 28th of March, 1819 the Savannah left New York for Savanash, and after a stop at Charleston S C, she reached her destination on the 6th of April During her trip southward she was under steam for a total period of  $41^{4}_{2}$  h urs—her longest interval of continuous steaming leng 17 hours—Shutti wifer leaving Sanly Ho k behin I the wind became somewhat fresh and it was found advisable tunsly her paddle whoels These wheels were so arrange I that they could be folded rough for their employm it. I kin in the six sast to rough for their employm it. The operation of getting them over the siles or taking them imboard required something like half an hour

The Savannah was intended to carry both freight The Savannah was intented to earry both freight and passengers. Let the accommodation of the latter her cubin space was livided into three salioons and those were hardened; furnished with imported carpets curtains and hangings and were decorated with mirrors. She boasted in all of 32 borths cach of which was a stater som that arrangement being something of a departure in passenger ships

parties in possession ships

The Savannah remained at Savannah for some weeks attracting a great deal of attention the while and being visited by Pirasdent Monree who reconsisted the belief that the government would ultimately buy and equip her as a mayd vissed. On the 22 of May 1819 the ship dropped down off lyber but owing to majorarish with a ship conditions shi did not just to sea until two days later. This with starting in the beaded boldly mit the Atlantic and straightenid out upon the northern course which was to carry her across to Liver pool. Her log which is in the U.S. National Museum gives the following particulars of her periods of steaming during her voyage to Furopa

May 30th 8 A M to 6 P M 10 June 11th 10 A M to 12 P M 16 June 16th 8 P M to June 17th 21 M Total hours of straming (Continue I on page 20)

# SCIENTIFIC AMERICAN

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Henry North Based 1 / for my set I may be I majored World 1 is the I majored World 
M. The hast best first from reasons and the second than the first from reasons from the first fr

# The Ship-Owners' Point of View

III RI are some more who have the facility of stating the facts of a sectionary complicated astronomy observed that he who time serve to and the such many NI if their Dollar on experiment of step owners of Sur I rancone where recently mode in maleys of the shipping estimation who is shiftly in the hands of extreme which is interested as updainting an incredant marrier, which means then it should be in the loands of every station of the Intel States.

He begins by giving a diagram aboving the preventing of American goods curried in American ships since the Hopablic was founded from which we bear that in 1789 two livel bees and eight results for each of an internal ships and that there are no ships and the preventing for the preferential duties the percentage ross in 1793 for the percentage ross in 1793 for the percentage found in the ship percentage ross in 1793 for the found in 1890 when it was 89 per cent. He preferential duties cuoued in 1890 and he 1890 for the preventing fill to 72.8 per cent. In 1890 for the 17 to 1880 mid in the forth half of 1813 up to the Greet War it was only 947 per cent.

As to conditions on the Portle Orean with which MF Dollar synaticularly familiar with cited that in 1913 Infrare the Samores Bill lind gotten in reducidly work lapanese cooses as the Annitean trude in the Partic were 200 by re call and American vessles were 20 10 per cent but after May 1st 1917. Lapanese weste were 49.90 per cent und American vessles as the direct result of the action of the Seamons Bill deceptor to 1917 or cent.

Although it is will multistroof that the war has lefted to wale for some or some a minute, it forms quantities it is permitted to tall a not of Mr. Bollier's figures for three of his constrainters which were operating in 1914. There mult risk themse power was exactly the same under the monopartities in the same. One of the ways much breat many for the ways as Bettele straint couplesting of an interface to ways. If 130 kp is month and the third ways of the same in the first tall ways. If 130 kp is month and the third was a Topice's of same couplesting 49 notice at a not transfer of \$777 per constraints.

And the questern I imported or ferrect to by Mr.
Dull is what of the new ment is shape regarding with the climate that there he dill teaching mental is the teaching of the hand which is board if the soft makers for the shappens, Bored and compare then with less own stainer the Robert Dullier on him with less own digners. But the Robert Dullier is a bin, so the But shapens are the Robert Dullier is a bin, so the But shapens are the Robert Dullier in a bin, so the But shapens are the Robert Dullier in a bin, so that the Robert Dullier is a bin, so that the teaching are the total we can our or a very so I 28 that tonn—a difference of 803 time. We since all port domains, probating develocking, etc., are longed on the

net tonnage the American ship or lurroun trade pays 25 per cent more than the ships of any other nation by aging a feel him that since this lifterine to paid in torrigin ports and to foreign mate os it is obtained that of a general feel the court of kines who our ships or their pushered under our him.

there has the matter of a business and the share and the s

Turbirmore out rigins root experienced shapeweer asks. It for the secretary than the indicate that the miles why on the root of the root o

That there is that closes of the Sanners fill which additional that the present of the research department additional medical and order the factor may give. It is intended to prevent energying Closes on the shape metal to compete the order of the primers have an it minded that the laparases are fact to navy Japaness researed Impaires of the continuous department of the comment. As regardle the clause in the Sanners fill providing the continuous description of the providing the providing the continuous description.

As regards the clause in the same a Bill perceding that the seame can demand dult of the wages be becarried at every port by goar! Mr. Dullar tills us that it has done great here to take or or subject to the reson that it is a temptation to the min to drink heavily while in these foreign ports. If all the well were gauge to be able to the seame to the se

I mailly. Mr. Dedlar patts in extrong plea for prevate as against government ownershape and we not plea to note that Mr. Harles is in the rough agreement with him on this point. I originally be present government secure to be undergound, i change of heart on the subject of government owner-dup. Invent thereto by the sidd logic of facts.

# International Trademark Registrations

All I R wating nearly near very we us at back to review nount of the brackets of the Pen American Trademask C avoiding. It now be comes possible for American class us to obtain a regarding and under the single reported in to as use trademark protection in all those countries of the Northern Group which lawer ratified the C mystelium Besalts the Luited States those countries are thus the Seales the Dominiscan Republic Hondures Normagus Costa Rus Guatemals and Paname

Unfortunately the benefits do not extend to the onthern Group of countries because of the delay in the ritification of the Conventi it by the South American states. It is also to be repetted that the normany h gislation has not been cauch I in the t inted States to permit the registration in the contro of all trademarks uguitred in the International Bureau le citirens of other country now members it the Convention brings up the same old question frecipiocity which our international patent and tradmirk attorneys find presented to them in the 10 st awkward forms. The funtion of reciprocity adopt d lev the legislators at Washington weans to be that the other follow has got to recipiocate first and their when we get good and ready we will reciprocate | his works fairly well when emidoved on one side mily but when both sides adopt if or when one side gets the I waiting for the other to act there is likely to be some embarrassment. This is felt not only in connection with the rights of Americans to the full benefits of the Pan-American Convention.

because of the inordinate delays in granting full and responded rights to the citizens of the other countries with a have ratified the Convention, but it operates equally in connection with our failure effectually to responsite in other patent and trademark matters

reciprosed in 10 forth privates and consequent attention of the Probably the most harvening of cutomone a with reference to the greating of extensions of these for the highest at our fractionary cases and for the payment of fees where the deleyes have been essent of the payment for either the other leading countries are greating such extensions freely with of ourse the expectation of compressity, and these extensions have been presented as the contract of the payment of the direction of nearly sating these contractors from the annuling fitting of the law it is feared that the one-model "reciprosety lear tofore extended to us abroad will be write-drawn of course retrieval to the sating these contractors of the payment 
Congress must eventually be brought to realise that, to safeguard our patent and tradomark rights, it to safeguard our patent and tradomark rights, it universary not me dy to ease it has which will afford unbeated by the best between the contrary, but his was the hall inflord substantial protection for the rights of foreigness her. Only in this way can our citatent hope to obtain in turn the fullest protection abroad. It is to be hoped that the education of Congress upon the point will not have to be purchased at the price of here y have in have read in price of here y have in have read in price.

### Phantom Limbs

THE RI AT A PARTIAL WHEN THE TOPICS WHICH SOME THE RE CHOOK OF ANY THE PROPERTY OF THE PROPERT

We find this artist noteworthy though not for the reason that potentially proqued its publication. The indicate field of war has lately involved the mutilation of thiman beings on an improved inted scale. Now it we a fact perhaps unformine to the average reader, that the illisons of phantom hims. In borrow a folloution co-pression from Dr. Werr Wittchell - far from being rare or vectorized is sulmost may read among persons who have undergone an amputation. Among 80 cases including a greaty variety of amputations. Mitchell found only four in which there had never been an illusion of this ham. Illustrate it is a mutter of some interest, not that it single example of the phenomenon has recently leave in practice in a sangle publication, but that the popular magaziness and the in wepspers are not at this juint time full of simular stories.

Can it lie that one of the personnal "novelties of science has at last remaind to be novel? Just how familiar is the subject of plantom limbs to the public at large? Just how familiar is it to medical men who have not made a special study of nervous phenomena?

One of the best discussions of the topic is that gives by Wir Mithell in his book 'lajures of Nerves,' published in 1872 The literature however, goes back to the satteenth centure when the phenomenon was well desemble by Ambrous. Park In recent times Dr. Charcot has given some prominence to the subject Whoever ears to pursue the matter will find fairly good bibliographics appunds in two destoral theses of the Para Faculty of Meditime one by Augusta Armdel, published in 1898 and the other by C Gulbenkian, published in 1892.

The fact that a great deal has been written on this subject does not, by any means, imply that it as widely familiar. Nastly every one of the accumulate topics that are continually crupping up as 'novelties' in the press can boast of a voluntamen, streature

We confess to being consumed with currouty to know why the great war has not brought forth a flood of stories concerning pains and other sensations in missing limbs

# To Our Subscribers

OUR subscribers are requested to note the expiration date on copies of Signwith). American If they will send in their research orders at least two weeks prior to the date of expiration it will sid us greatly in nudering them "fishout service".

## Naval and Military

Place Tribute to Our Reserve Officers.-A well deserved complement was paid to the officers of the United States Naval Reserve Force by Rear-Admiral W S. Sums in the course of a Victory Loan speech in New York city "Had it not been said he, spending work of the reserve officers I do not know what we should have done The accomplishments of these young men were really wonderful Starting as raw landsmen, many of them within them. men, many of them within three months became as good deck officers as were our own men and many of them were on the bridges in command of destroyers

Brooklyn Army Supply Base - ot many people in the country are familiar with the great army supply bess which was built in Brooklyn for scrumulating and forwarding supplies to the American Expeditionary Force in France One of the new reinforced concrete es measures 980 feet by 200 feet another in 980 feet by 306 feet and both are right stories high re are three, covered double decked piers 150 feet wide by 1,300 feet long and there is an open pur bo feet wide by 1,800 feet in langth All of this work was emergency construction which was put through in a romarkably short time

German Submarines on Exhibition lhe dis position of the five German submarines which were brought to the United States will be as follows | | 111 after being shown at Portland Boston etc. will lay up at New London 1 117 after venting Philadelphia Wilmington, Charlestown etc will be summed to Washington, D ( | I B 88 will pass by way of Savannah Tamps, Mobile and the Missuspin to St Iouns and then by way of Galvaston Lc, West and the Panama Canal to San Pedro UB-118 after chibiting at and shout New York and the Hudson River will lay up at New London, and UC 97 will pass by way of the Ht Lawrence and lake ports to a lurth at the (nest Lakes Naval Training Station

Maintaining Ordnance Material -Ihe General Staff has prepared a table showing the ordnance material which has yet to be completed Although large orders have necessarily been cancelled since the signing of the armetice, a vast amount of needed material will be completed, for the War Department has determined to maintain an amount of ordinance material amply sufficient for an army of half a million men I has we are oing to complete 396 240-inin howitzers 892 6-ton tanks, 341 155-mm guns and 100 30-ton tanks The total number of tractors when the present contracts are completed will be 1 000 21-ton 4 000 5-ton 2 800 10-ton, 267 15-ton and 100 20-ton tractors Of tanks the number is 15 3-ton 950 6-ton and 100 30-

Drydock Shortage at New York -It is stated that at the present time in the port of New York there are only 15 drydocks that can accommodate ships whose length is 350 feet That is to say there is accommoda tion for about 1,500 000 tons of ships If the Mhippin Board's expectations are realized the United States w possess 16,000,000 deadweight tons of shipping in 1920 and there are, according to an article by Raiph U Fitting in the Brening Post, only about 55 cummercial drydocks over 350 fort in length in the entire United The English found that one dock capable of taking ships 350 feet in length will handle about 95 000 tons of ships Unless we take the matter in hand at once, our own fleet will be severely handscapped by lack of docking facilities

A Tunnel at Gibraitar -Now that the construction of the Channel tunnel is assured, military and con mercial interests are turning their thoughts to the Straits of Gibraltar and forecasting the advantages which Strang on specialtar and force assum the navallages when would be sequed by building a tunnel between the European and African counts at that point. An en-gracering journal in Great Britain states that when it now takes where weaks to go from London to the Cape, with the Channel tunnel and one under the Straits Gibraltar it would be possible when the Cape-Cairo Railway and other rail connections are completed, to go from London to the Cape in sight days Unfortunately, the Straits are about 1,200 feet deep and unless the underlying rock is impervious to water, no tunnel can constructed there, since the limit for the passumata

### Science

United States Fixed Nitrogen Administration in organisation bearing this title has been formed under the joint control of the bear targe of War Navy Interior and Agriculture, for the purpose of taking over and oper

ating all the Federal plants designed for the fixation of mtrocon and the manufacture of ammonia and mitre acid American Society of Mammalogists -The organi

saturn meeting of this new sorney was held at the H National Museum in Washington April 3d and 4th with a charter membership of more than 250 Dr ( Hart Morrism was chefed president The society is to devote its attenti i to the study of mammale in a broad way including life histories habits relation to plants and animals, evolution pal ontology anatomy etc. The society's Journal of Mammalogy which is to start publication this year will include popular as well as

A Fraining Course in Public Health Administra tion -In order to enable busy public health officials from various parts of the country to come into contact with American leaders in metters relating to public health and acquire valuable mw ideas is lenef practical training course in public he ith administration is to be given in New York City this spring under the suspices of the New York Academy of Medicine and the New tork Bureau of Municipal Research | the course will cover a period of an weeks beginning April 10th The first three works will be devoted to ke tue-conferences conducted by experts of natural reputation and the work and institutions in and about New York (ity Attendance during the second half of the course will be optional Applications for our diment may be sent to Dr Carl F McCombs Buresn of Municipal Research 261 Broadway New York ( its | 1 lic present plan is to limit enrollments to 50, and t give first consideration to those actually engaged in public health administra tion but these restrictions may be relaxed

A Chemical Test of Ocean Currents -During a recent (apedition on behalf of the (arnegie Institution Dr A & Mayor noted that in the tropped Pacific whenever the ship met with a decided countercurrent running in an easterly direction against the prevailing westerly drift the water became relatively and 1 ha easterly current is often an ountered in the region of such law-lying coral mands as Palmyra and the Phoenix or Umon Groups, and is dangerous to vessels at night as there are no lighthouses, and the vessel may be driven on a reef before the presence of the current has been Whether the water is relatively and or alkaline can easily be determined by the use of some such in-dicator as thymolsulphonephtale in One has only to mux the water with a few drops of the dye and if the mixture is greenish-blue it is alkaline, while an approach toward activity produces a more nearly yellow color. This method may also be used to determine when a ship passes out of a current of tropical origin which being warm, is alkaline, into another current of colder water which, on account of its low temperature is less alkaline than the sea-water of the tropus

Bussian kanforations of the Siberian Coast -One of the most surprising pieces of news that has come lately from Russia is that, in spite of untoward political conditions an ambitious campaign of survey work in the Arctic Ocean along the Siberian coast was undertaken in the summer of 1918 under the direction of the Russian Hydrographic Office A programme of those under takings was published last November in the C s pies Rendue of the French Academy of Science by the vell-known oceanographer, General J G Shokalski who u still in Petrograd, so far as known Hubsequently General Shokalaki has found means of sending kitters on the same subject to some of his scientific friends in the United States The explorations were to be carried out by two parties One, working from the White See castward to Cape Chelyuskin was to be under the command of Captain Vilkitskii, the discovered of Nicholas II Land and the leader of the expedition which made the Northeast Passage from Bering Strait to the Atlantes Ocean in 1914-15 Another party surveying from Cape Chelyuskin to Bering Strait, was to be com manded by Capt P A Novopashennu Several new radio stations were to be established to facilitate the work of the expeditions

### Industrial Efficiency

Where the Building Problem is Being Solved One of the raties that has been foremost in beginning to solve after-the war ja d lems is Portland Ore which is cooperating in the building companyes of the United States Department of 1 of 1 According to pleas the city will construct not I so than 2 000 h uses this year Oregon is the source I in immens I unber supply un? there is an abundance I skilled I I i I r that ices n the outlook is reported t I mest n maging for build ing activities that will ils it it I st part of the surplus

New York a Housing Problem While the United States Department of I al ar has estimated that there costs in the country i shortage f '00 000 h uses as i result of the at ppage of building by wire uditions it is probable that half a mille a does not a wer the actual deficiency Reports from New York city show that living quarters there are now at a high premient have give up approximately one third in d rate priced apartments being subject to the largest incic ise ids of war wirkers have been trowded into the esta and the regular growth has been advanced in mini other ways America of Legatics shows an encouraging increase of building although it has not yet reached one third of the parmal volume of a matruction

The Coal Cover 1h small and unsuspecting rover has with not a doubt been the direct encire of a great many serious weidents that here dane their share in compiling the grand total of accidents that have curred on and about public buildings. A great many of the injuries caused by coal curves could have been me vented if a single ounce of precaution had been taken by the caretakers in charge of the buildings In vestigations prove that in a great many cases the direct cause of an injury caused by a coal cover has not been due to the neghpome of the owner par to the defective condition of the cover as a means had been provided for securing the cover to its movings and the casting was in the less of condition. The dire I cause is that the jameter or others has not securely fastened the chain when the cover has been just by k in place after it has been removed to allow end the placed in the cella.

Why Factory Smoking Should Be Stopped important hearing on fire prevention was recently held in New York city before the State Industrial Com mission. The danger of fire canned by smoking in factories wer ducused by several witnesses One authority make the suggestion that the regulations prohibiting smoking in factories be extended to 24 hours a day so that an employee could not smoke until he left the building I has authority also emplosared the danger of fire caused by employees lighting eigarettes and eigars as they were leaving the factory and car-kash throwing the lighted metch ande. Discon-tinuance of celluloid eye shacks was also advocated because they were so inflammable Several metances were cited where evenhades had enoght fire and the wearer had been severely hurned. It was pointed out that eye shades of this kind were not only a danger to the wearer but to his follow workmen as well

Scrapping the German Submarines Consider able importance is attached to the recent purchase of 25 German submarance by a British firm of 1 andon and Swanzea which will undertake to break up these vessels and dispose of the scrap metal. This firm is a large ship breaking company and during the war handled considerable quantities of wrap iron brought over from the battlehelds of Irance It recently purchased at auction 25 German submarines 12 of which it intends to bring to its works in Swanses. It is estimated that the breaking-up value of each vessel will be \$12 100 and for the dozen \$145 992 The work on each sulemarine will occupy 10 weeks and considerable additional labor will be employed by the company The scrap metal thus obtained will be sold to the various timplate and steel mills in the Swames district. This development of the ship-breaking industry in Swansca will be a very un portant one not only to the part and as a means of our ployment but because it will provide great quantities of high-class material for the timplate and steel industries The remaining 13 out of the 25 submarines purchased will be broken up by the same company in other ports of the United Kingdom



The Assyrian city of Nimrud, with the walls of an Assyrian palace projecting from the ground



Large stone monuments in the public square of Assur. One of them bers the name of Shamiram, the Semiramis of ancient legend

# The Future of the Archaeologist in Mesopotamia

A Wonderful Field Opened Up to the Explorer

NE of the good things to follow the cycle of the great world war is the opportunity for exacation work among the burned sitted of the Great. Did you ever stop to think that must suits of the great. Did you ever stop to think that must suits of the runs of all the tritos of the ancient wirld are or have been in Iurish to retrory? An order of the Great was a 1 irish per lor being an order of the

house. The sets of all the seven wonders of the amount wild have ten would by the Units. The effect of the critical manner of the critical had not the shands was shore? Phrygia the Hittitt I and Armeni Assaria, Babylonia Varbas Svina Holstine Lypt and Carlings and other cits of northern Arme all the hands where are not the story of the critical state Turks And no people have been less wirthy to inherit the homes of past civilisations Whenever a Turl has found a human portrait sulptuicl in stone by some ancient artist it has been his sacre I duty to destroy it the Mahom medan religion does not permit the rep resentation of the human or animal form. Thus many a priceless treasure of the carly world treasure which every man respected tall the lurk came, has been made worthless. Many a burned city has been used as a quarry for building stones and its treasures of m scriptious and sculptures have been lost to the world. The templa of the wealthy Greek city of Cyzacus on an island in the See of Marmora is an illustration. An aged lurk long made it has occupation to starch among the temple runs for marble. With some of the larger metholocks he built a lime kiln, the rist of the marble he broke into fragments to throw within the kiln and convert to lime. It muttered little to the Turk if the marble bor an early Greek inscription or was a bot an early terrex inscription or was a leastful piece of statuary or a sculptured capital which any Luropean museum would prize it was broken and turned to would prize it was broken and turned to hime. At Mosul just before the war, e great stone bridge for the Bagdad railroad was built across the lights I very stane in the bridge was taken from the walls of ancient Ninevah. On the of Ninevah the workmen found a huge guarded the entrance to the palace of an Assyrian king. I tried in vain to rescue the monster from the hands of the

vandals I saw the men break it up, load



The city gate of Assur, the first capital of ancient Assyria. The medica name of the rain is Shergat

the fragments into baskets on the basks of donkeys, and transport them to a lime kin. The lime was used for comenting the stones of the bridge. The walls and temples of Babylon, and the palace of Nebuchadaears, have long been quarred for bricks. Even the streets of Nebuchadaears, have long been quarred for bricks. Even the streets of the asseptioning city of Bildia are paved that a street of the streets  The streets of the

Defore 1877 Purkey possessed no srebacelogical law, and until then everyone who could command the means and sativity the owners of the land and the local authorities might dig wherever he would Therefore it was before 1877 that the great archaeological collections found their way to the British Museum and the Louver Since them the Turking overnment has placed every possible obstacle Louver Since them the Turking overnment has placed every possible obstacle long and difficult process. It took three years and about 38,000 to secure permission to excavate two missions of the security of

### Plants That Make Stones By S. Leonard Bastin

I T is well known that plants are continually taking up various mineral substances from the soil Most of this matter is spread about in various parts of the organism and is not very apparent to the casual observer.

Now and again, at certain points, there will appear an accumulation to such an extent that stones are produced. Thus, occasionally, inside the stems of the bamboo a hard rounded mass is found just at the joints of the cane nava roundest mass is found just at the joints of the cane. These are of a silicious nature, and probably represent an excess of silica taken up by the plant. Even more interesting are the coccanut stones which can at times be dug out of the endosperm of some kinds of cocoanut These are usually round but they are sometimes pear-In color they are white, and not unlike pearls, although not so lustrous. As a rule these stones are about the size of small cherries and they are quite as hard as felspar or opal On account of the ranty of these hard as felapar or opal. On account of the ranky of the in-coconaut stones they are very highly valued by the in-habitants of Java and other East Indian islands. It is generally considered that they act as charms against disease. These stones have been carefully examined and they are held to be composed of pure earbonate of

Somewhat similar processes are occasionally proin pomegranates Apatite has also been discovered in teak wood. The curious water plants called Stone-worts (Chara) gover themselves with calcarous deposits This is so much the case that as these plants die down anis is so much the case that as those plants die down each year, the bottom of the pond or lake is appreciably raised by the accumulation of lime which of course does not vanish with the decay of the stems

# Mobilizing a Lady Bug Army to Fight the Aphia By Horace E. Thomas

NOW that spring has come and the chill of winter no longer retards the growing grain a strange army is being marshaled forth into the cereal fields of the Pacific Its divisions, brigades and regiments are composed of lady bugs and they are sent out to attack

composed of lady ougs and they are sent out to a their natural prey, the aphin sent sent out to a Scientists have long recognized in the lady bug, lady bestie or lady bird as it is variously called, a beneficient agency in its disproportionate struggle to exterminate the aphis, or plant louse Herstofore the bugs have exercised complete freedom in their go-as-you-please efforts to hunt treeuon in their go-ma-you-piesse chorts to hunc down and devour the aphis. Now however the lady bug, which perhaps is least offensive of all the huge bug family, and for which nearly everyone has a sort of freedly feeling, has its campaign mapped out for it and will be sent where it may do the most

od by enjoying unlimited gastronomic activity
The lady bug hibernates in the winter — It is no The lady bug hibernates in the winter of a tropism that warms it with the approach of cold weather to seek shelter In colouies numbering a million or more bugs it bivouses in the mountains and foothills, There, protected by rocks and crovices, it lives safely There, protected by rocks and orrovices, it lives safely through the ood weather. What it is goused from its stuper by the spring sunchine it again makes its way to the lower levels when the tax of the strength of the the strength of the

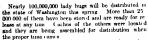


The stonewort secrets so much lime that its autumnal decay raises the level of the water bottom

it is believed that the lady bug arm; will accomplish mo toward eradicating the aphis if left to its own devices Others consider the plan as promising permanent relici to the farmer, at least in some localities All authorities



agree that it is worth trying and are cooperating to make the test complete and decesive. That it is a matter of real importance as well as interesting as a novelty will be realized when it is considered that the annual plant destruction by aphids in the Pacific northwest alone entails a loss of from \$10,000,000 to \$20,000 000



Agents of the United States Forest Service have taken the lead in collecting the beetles. The forest ranger has exceptional opportunities to find their eaches exceptional opportunities to find their factors which he came upon a colony be rejected it to the country agricultural agents who were esperiting in the work. It was no trick at all to scoop the bugs interaction is to be their accountry to the control of the second of the control of the con which were to be their newhone. The receptualism partly filled with excelsion which served as a roost and the bugs were stored away to be kept through the winter. at as constant a temperature as possible in the neighbor-hood of 38 degrees above zero. In one instance an aban-doned brewery was their temporary home, another huge conce for were was their temporary nome, another buge colony occupied an apartiment in a meat packing plant, which was kept comfortably near the freezing point and where there was no fuel problem to worry them. On bright days they were taken out to sun for a few hours to check any fungus growth that might kill the beetles

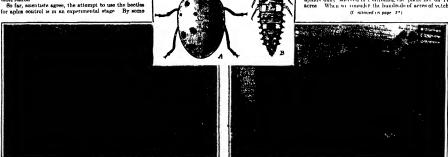
The Bureau of Futomology of the Department of Agriculture through its station at Forest Grove Ore, has cooperated in the enterprise to the extent of collecting data and giving advice. Results will be carefully tabulated and a complete survey prepared for publica-tion. The men in the entomological service have been careful not to give too great encouragement to the may be beneficial under certain conditions, they believe, but where the aphis is at its worst they have little hope that bettles can be assembled in sufficient quantities

This opinion is shared by Prof A ( Lovett, entomologist of Origon Agricultural College, who has made a thorough investigation of the lady but the as a inade a thorough inviceigation or the says be used as a natural for of the aphs. In normal years he says the aphsis pet is kept under control by the lady bug and other neemen a such as the syphis fiv the larve of the late wing fiv and the lampyral bettle all of which, including the larva of the lady bug devour aphids

m great numbers and a minute wasp that kills them by its sting. The common impression that them by its sting. The common impression of the weather kills plinds is a unistake, he adds, the fact is that warm days are favorable to the meants that destroy the aphid. When a to the meets that destroy the aphid. When a few warm spring days are follow. I by cool damp days the aphis thrives because its insect enemics are mactive under su h cachtions

When there is a 1 all outhr ak it aplas such as practically destroyed the yet hecrop of western Oregon in 1915, there is little hepe of relief from hady longs at ording to Profess r Lovett. The chimatic factor then presented an insurmountable harrier to the successful use of natural enemies. he says and continues

In an experiment curred on last year 210 pounds of In an experiment curred in list vier 210 pounds of aphids were celleted from a 12 vir thild of with. It was estimated that this constituted 60 per curred all was estimated that this constituted 60 per curred all mounts of the proposed of plant in the same of aphics were counted announting (+513 - 1 his would be then perporamently 254 6000 pilotia in a pinul in 88 900 000 on the 12-acer tract. Ingered on these bases 25 000 000 and by bags would if decouring, then maximum of 200 sphids daily succeed in controlling the plant lice on 77 acres. When we consider the landreds of acres of vetch



A indy-bug colony, at hame for the winter, from which two million bugs had hear removed before the picture was taken. At the right, eacks of the bugs prepared for "live storage" in a safe place; above, adult (A) and larra (B) of the aphia-cating lady bug

# The French Problem of Reconstruction-III

# The Practical Methods by Which the Devastated Home, Farm and Industrial Plant Are Being Rebuilt

By ( H Claudy, Special Correspondent of the SCIENTIFIC AMERICAN in Paris

Till outstanding fact to the onlooker hay will be sense. In that I rance has I suid d that all I rance shall pay for risk damage done typeri of I rance. When and how Garmany shall pay to I rance does not surer mine be quantion. I not use will all brance to going to a will be damage, done in paid of times. If res parhaps so that a disconsisting of the mine of experies when extractions of the mine of experies when extractions of the mine of experies when extractions. rotan lla ar an an and

been seen in all listory
Practically it on inset for the Government has vot for pay individuals in full for the honge they have suffered disorse maning to the line to form to indicating full. It has by in north is wey. currature to motocraft pour rides may be not true to combinate though upon the poly of the true to see the distance of the motocraft to be considered to be the way to refer the habilitate the model that and retemblish the refugers

is none the less magning.

The eart is thus put before the learner the cacut of the remedy before it means of applying it is described because it humanizes a subject offices a apt to be con-sidered somewhat dry. Reconstruction agreers a makerd women hand dry. Recomstruction ingresses as serves both to and brought up to governments are not apt to seem thrilling wet seem on somewhat execu-taceped in government ried type and ulse not though case fund the thrill in these fif at of a sorrly treed proph to head the ownershess and make. It is this it remove as specially an possible what only the seem of the contraction of the bedfore, the wast. subsed somewhat dry

efore the was are so accustomed to the sound of money climking in sound of money conking in appropriatous which run into billions that we are a little apt to look at the little apt to look at the little appropriations as small But it should not be forgotten that the standard of living of the French country dwel hr (it is said with all respect to the heroic I reach pessant) is decidedly lower than that of the country distrects of the or one country districts of the United bitates and that it requires much less to give him a home and put him to talling his soil than would in the case work a similar amount of devastation as complished in the United 4ta tou

The French Government began assistance to invaded regions almost as soon as the war started Six hundred thousand dollars was vot the invaded community of the Marne in December, 1914 In the hudget for 1915 the I reach Government included auxty millions to be applied by the Musster of the In nor in relieving destress in

terror in full regions. Up to August 7th 1918, there's six millions of this had been spent six to drain miles sax for materials two and a half for general supplies and the rest underdually in ten invaded Departments

half for general supputs and the real untrivinitary in scin-moded Departments of the control of the control of the con-Government work does grow here a lurgest these a committee here a special service and uncorrelated and efforts of the control of the control of the control of the efforts of the control of the control of the control of the forth of the control of the control of the control of the constitution as early as 1916. Later there was an inter-ministerial committee supposed to correlate the activation of different governmental departments. A law was proposed tomp thing (if) planning for destroyed towns notly allow it has been aspipemented by requests, usually met in the spirit in which they are made and another for repairing damaged buildings was put in operation, arrangements were made for making advances to returning refugees of a citizen smooth of the probable total indemnity they would oventually receive, to returning refugees of a retain amount of the probable total undermity they would continuity receive, the Ministers of Commerc, and of Agriculture have been given appropriations to make jurnifuse for their respec-tive reconstructions a special service was inaugurated in 1817 for getting the soil lack into italiable shape, and a variety of similar undertakings put under way.

Naturally with so many diff reat activities going on it soon became owdent that a watral head was an essential if the rade of officers were to be at all wall served (onequently the Ministry of Indocrate itegories was established divid 1 its four man branches, Regules was established divid. It is four main branches, by supply the with the general is assurant or of local life paying it of which the state of feel proud

office has been absorbed by the Il Ministry of Arms which is now engage ! t

plants back to a peace basis What it docs as th whirels revolve has been indi-graphs Of course it does or things but non-more important than this giving of little trifuge feeling him cluthing him giving his to be and last and best giving him advances on his ultir ite total sudemnits that

Between two fires

After a hall of metal from American batteries as a preparation U 5 (which; press captured this village of Yauz on July 1 1918)
Later the Books attempted to take it best and occupied if for th brid figure of an long or so The American rempted
the and progressed for to the north The Villag (sig. The saight between the bree-mes a refu

he may reëstablish himself permanently in the country from which he was driven and thus aid in reëstablishing

Advances are made up to 90 per cent of the appraised value of property valued according to pro-war standards This leaves a wide margin of safety for while the final In leaves a wide margon of safety for while the final lis not by the st, it is no practically settled that undemntites will be paid to cour the cent of replacement in ind regardless of me as wide cent of both materials and labor. This fine, sportsmenthles and bleral sittings of Irance—all of France t ward the suffering part of France sur rather overflook I in these days of exacting Peace Conference and Le use of Nations publicity But it is fine, more that less Iranes says to her refuger You have suffered Your house was destroyed, you land runned your furnitus stoien or burned, your statk commandeeved or kill of your whole plant taken from you. We propose to r plast it. If your house out Acold France to build in 1914 vol. can have Acoll for low to build in 1914 vol. can have Acoll for low to build in 1914 vol. can have Acoll for low to build in 1914 vol. can have Acoll for low to build in 1914 vol. can have Acoll for low to build in 1914 vol. can have Acoll for low to the sufficient of the sufficient part of the suffici satic commandered or all d your whole plant taken from you. We propose for plant taken to flow propose for plant taken to flow propose for plant taken to plant taken and the propose for plant taken passed you shall have 10 500 frames more if it costs tages at temms as much to build not set been. And the same with your tools and your sabelt, you who have been for Prance, the flow proposed to the plant taken taken to the plant taken 
Meanwhite the visio has taken the right to requisition remed buildings for hudding material, although no objec-tion is under to any man taking the runs of his own properly to rebuild if sate with he will and can To the passant mat to his wife and children, his household goods have always bean his most pressure prosecutions. He siture of refugers with each commodate, household goods have aways room, as accompanies to prosecutions. It startes of refugues with earn containing beds chairs stows, cadles creeying along the roads after a river stories vor farmer Presidenas would asked a river stories vor farmer by reachanas would almost part with his rots before he would go with a large and Pontaine work in a very versiding, to fair that has gort remarks be speed to give him day yet be can not rout if his words with the whole along the property of the proper

down still restify that what the I rect is dot not know about a bargan in out worth farming! "on the I ran is govern me at needed ion naturations that farmiture and household goods were going for out a led of mensy. I looked like an easy thing the government paying refugeas money with which to how furniture. But the government as the point and squeleted its furniture profilers, if our properties of the contract 
tifus in advance of the payments made to refugees

such furniture includes
chairs tables beds, oupboards and wardrobes and also doors windows and

shotters
While there is no waiting (wheever will can get to work on his individual recon struction problem at once), there is a full knowledge that at heat the task must be sion Hence in preparation for eventual full reconstruclion the government is now buying building material as well as making preparations to house and feed workmen in temporary quarters so the may start the post-ful invasion—for rebuilding of the suvaded and destroyed regions Such materials will be given out to cooperative groups of contractors by the

groupe of contractors by the government according to rand percently rules Cooperative effort is being employed wherever possible as stating competition for both labor and material, and making the reconstruction a

or vasue on July 1 1918 making the reconstruction as a run community rather than an individual matter. For instance, in several sea south of Chalons-sur-Marne government organised cases south of Chalone-sur-Marine government organized communities have formed coherative souscities which have found coherative souscities which have been considered together property owners (former property, south of what we unpulse a contractor and an arablest in common have been able to save much money in making purchases and by having projects of sufficient mass to be seen by governmental syss, have been able to command the service of some of the nearly muse handred thousand German pranners who are now working out a passing justers and their own destinate by laboring to rubuild the France they did their best to destroy!

Scratched Joints Versus Smooth Joints in Gl

Scratched Joints Versus Smooth Joints in Qilpius THE common assertion that stratisfied myfaces are hard to prove Comparative tests made on several consances by the Forest Products Laboratory all indicate that the strengths of these two types of joints are practically the same. The test specimens used by the Laboratory were paire of hard maple blocks, some with smooth and some with tooth-planed contact surfaces. These blocks were glowd with a high grade hide gitus, allowed to stand for a week, and then statered apart in an Olsan universal testing massibne from joints of each type were compared in a magle test.

# Light and Progress

# The Part Played by Artificial Illuminants in the Development of the Human Race

By M. Luckiesh

"O first created beam and thou great Word,
'Let there be light and light was over all'
Why am I thus bereaved thy prime decree?"

THUS through "Samson Agonistes' comes the lament of Mitton, whose eye-aight has failed Perhaps only through a similar loss would we fully appreciate the transandous importance of light to us, but imagnation

tremendous importance of light to us, but imagination should be sufficiently capable, if duly accrued, to convince us that light is the most essential and pleasure giving phonomoun which makind experience. The importance of light is early recognized in mythology, being the solverment of the Creator immediately following the creation of "the boaven and the earth," and the word "light" is the 46th word in Genous, the First Book of Moses Light has played a conspicuous skie is the architecture of many nuclear-in role in the mythology and religion of many peoples—in many cases the leading role—Throughout all time both primitive and civilized races have had gods and goddesses of light Even today there are people who worship Light as the god of all — and in a sense they are not

The poetry of all ages abounds in the use of light and color for clothing the emotions, suggesting the possi-bility of a language of color, at present but vaguely appreciated The poet has availed himself of the powers appreciated The poet has availed minsen or the possess of light and color on the imagination in exciting, heighten apprenaised. The poet has availed inimet of the powers of light and color on the imagination in conting heightening, and extending ideas and sentiments, in the ron-struction of epithete, in the decoration of figure, satural relativistics, and in all the imagery and witchery of his article, and in all the imagery and witchery of his merely fanofully or conventionally, but even these uses merely fanofully or conventionally, but even these uses monoments they have sequent agmidistion smaller to words. Light and colors doubtless have their offsets upon the pisson, feelings and intellect even though their language is not at present plan to us. Is it not suppose the properties of the propertie Light has many synonyms, but one which we would apply as very befitting in Progress. The truth of this is readily shown by reviewing the history of light from the dawn of the race to the present time. If we go back in imagination to primitive man whose activities were bounded by sunrise and sunset we gain an idea, by contrast, of the complexity with which light is intercontrast, of the complexity with which light is inter-woven into our activities. In our retrospection, written hastory fails us long before we reach the primitive ages However, we can safely trust our imagination to penetrate the log of conturns of unwritten history and find primian huddled in his cave as daylight wanes pelled by the evolutionary spirit of progress primitive man desired to extend his activities beyond the boundaries of daylight and eventually learned to make fire This furnished him with heat and light which achieve ment elevated him from the brute kingdom and marked the beginning of the genus home

From the pine knot of primitive man to the wonderfully convenient light sources of today is a long interval consisting, as appears retrospectively of small and simple stop, long periods apart. Measured by our present standards, progress was slow in the early ages and we are inclined to impatience as we follow the history of we are inclined of impactance as we collow the instructory recent light and progress even in the comparatively recent centuries of written history. As is ever the case civilization must constantly readjust itself to the discoveries of science and the developments of invention. Only 100 years ago the proposal of lighting the streets at night met with loud protests based on various reasons, theo-logical, moral and economical but after adjustment to the new idea, civilisation is requally vociferous in com-plaining of the darkness of streets

The burning fagot rescued mankind from the shackles of darkness and the greage lame and tallow candle have done their part in paying the way for man's achieve-ments of today. Artificial light extended man's activi-ties and has been an important factor in mental development It perhaps has ever been true since the advent of artificial light that the intellect has been largely

nourshed after the completion of the day s work
Artificial light has been an important factor in the
great progress of the present electrical age. Man now
burrows in the earth, navigates under water, travels on

the surface of our sphere and sails among the clouds piloted by light of his own making. Progress does not halt at sunset, but continues 2 hours e.h day. Building printing, manufacturing committee and other activities are prosecuted continuously the working shifts changing every eight ten or twive hours regard. some changing every spart (in o twice it has regard less of the rising or setting sun. Artificial light affords man an opportunity for study or recretion after be has done in days work in company with the sun. The great achievements of the artist and artists narr not in obsourty affer suisact, but are to be soon by right as will

If some great genius could evaluate the possessions of mankind artificial light would appear conspicuously in his report and doubtless would rank very high in imporand value Among man-made things perhaps it would rank first in value. In the production of light, man s early efforts resulted in light of an orange red color. The meandescent lump industry began with the carbon filament lamp in which a han like filament emitted a deep yellow light. As the industry developed through the combined efforts of many individuals en gaged with various allied problems the temperatur of the filament has increased the light has become whiter and the efficiency has been multiplied many times Lach improvement has resulted in a slight step toward artificial daylight Foday the efficiency of the lamp is so much higher relatively than those efficiencies of older lamps to which the pocket book had become accustomed that it is practicable to convert the light into any quality or color which necessity or esthetic taste demands last steps in finally reaching the objectives have been sass ac, ps in many reaching the objectives have been made by temporary expedients—by the divelopment of colored filters which convert raw light into light of more desired qualities. These ends will principle reached some drey by more direct included. I victually seem tific discovery will perhaps give us a practicable lamp. which emits artificial daylight directly from the light source and others which meet various esthetic and

source and oracis which much various estimic and psychological requirements. Imagination is indeed dead if it is not awakened by a retrospective view of the development and impor-tance of artificial light, and of its contribution to the progress of mankind

# Correspondence

The editors are not responsible for statements made in the correspondence column Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired

### How to Build Soil

To the Editor of the SCIENTIFIC AMERICAN

In C H Claudy s article in the SCIENTIFIC AMERICAN on the French problem of reconstruction and referring to the damage to the soil resulting from shell fire he

on the French problem of reconstruction and referring to the damage to the soil resulting from shell fire he says that "a shell which explodes beneath the surface of land, churst up, hourse theo pool and brings active to the loy which will not grower to the low the

inogen. Sweet clever will not only grow under very adverse

conditions, but it will furman nutritious pasturage, rich hay and valuable sitage. Sweet clover is also of the utmost value as a source of nectar for bees

EVERARD B MARSHALL

New York, May 2, 1919

# Farming for Returned Soldiers

To the Editor of the SCIENTIFIC AMERICAN Your Secretary Lane makes it clear in his article in your issue of November 9th, that there are farms enough to go around among the returned soldiers, so far as the to go around among the returned soldiers, so far as the mere matter of land is concerned., but he does not enter not any explanation of how the soldiers are to be asked to farm them. The great and important question of soldier settlement is right up to us today, demanding our best thought and attention. Yet so far as I have been able to note at is being approached, on both adder of the world's most peaceful frontier, in but a half hearted way, and from the wrong viewpoint entirely. I have recently written to the Officaus Journal upon this sobjects, and our belong the liberty of putting the views and can belong the liberty of putting the views. So far as I have observed, all the schumes proposed for the settlement of returned soldiers, including egetantly the one finding efficial acceptance in Canada and presumably the one Secretary I ame has it mund, are

presumably the one Severetary I ame has in mind, are amply modifications of the old system of farming—or at best attempts to graft innovations thereon Yet this system is by far the most expensive and extravagant

this system as by far the most expensive and extravagant ones that could possibly be adopted. I can conceive of no plan that would be more wasteful of time, labor, building, and the equipment accessary to carry on the busness of farmang, and pet the effort is being made to induce the returned men to accept these methods. As a rule, at the present time each farmer has he own set of buildings, standinery, horses, exitie, and the necessary purpolarisist or as much thereof as he can afford, and about he be fortunate accept to have selficient halp in the family he worms along. I return to any that on every those average uncoostill farms of the synthesis.

100 acres each there would be found sufficient machinery and other necessary equipment for the successful work-ing of 1 000 acres—with the possible addition of one team of horses or one tractor

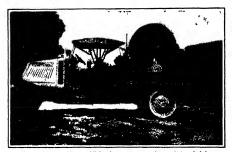
The tune the farmer wastes in marketing his products. and the methods employed are worthy the most serious consideration. In this same period with more efficient methods, he could quite as well market ten times the quantity

The same arguments regarding waste of time hold good the same arguments rearring waste or time note on with respect to the work around the buildings—chores such as milking feeding, deaung of stables and general care. These in ist be attended to daily and at present the farmer is tied hand and foot to his farm and forced. to neglect other matters of importance to his frequent to argues other matters of min) retailer to ma frequent financial loss. No wonder the young people fee to the city with such unanumity! And this or a modification thereof, is the scheme that we are apparently going to ask our returned licious to take on in order that they

may carn their own living and help to bear our burdens.
This prospective advent into the farming game of a great quantity of new farmers, who will farm new lands should be seized not as a mero incident in the extension and perpetuation of the old old system, but rather as golden opportunity to install a new one All the great industrial and national undertakings succeed in direct ratio to the measure of intelligent cooperation with which they are prosecuted It is suggested that a great effort should be made to utilize the creation of farming communities of returned soldiers for the introduction into agriculture of these same benefits. The details of a comprehensive scheme of cooperative farming and cooperative marketing are far too numerous and in-tricate to be worked out in a letter to the Editor, but without doubt the men who had the sand to drive out the unspeakable German would be well able, with necessary and competent supervision, to arrange such details to their own satisfaction, benefit and advancement and, let us point out, at the same time to the benefit of all the rest of us

A. H. HAWKINS

Ottown Can



A light-weight portable searchlight of great range used in anti-aircraft defense, after the attacking plane has been located by sound



A parabolic mirror for sound, which enables a hostile plane to be located on the darkest night, and at surprising distances

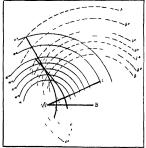
# Listening for the Enemy

# Sound-Ranging Devices Employed to Locate Hostile Guns, Planes and Submarines

I may be taken as a maxim of modern warfare that wherever the enemy is and whatever he is doing he will make a noise in doing it. If he is kning a hig gain at us from fairly near he will he he both only a well he ar him on a dark night with a eage of bomble we will he ar him in a comparatively solint activity like submanning we may need to use arither to bring him above the tirch he de audibility. But in any event whatever the circum stances rest assured that we can har him.

In the effort to take advantage of the situation both parties to the lace conflict exerted thus ingenity early and late to divide apparative and to improve methods of soun Iranging on 1 and and in thin in and at set. The first place where the act of locating the to by listen ing to him was brought to a first state of periction was in searching for distant and coneral distants. Without developing has eleborate apparatus, a little ingenity in the practical application of a very simple making material principle involved is more or it is general to encaded gans with a very decent degree of accuracy. Since the principle involved is more or it is general to all sound ranging it may be worth while to look into it with some fullness.

Suppose we has two observes stationed at A and at B 4000 fact Apart and council by trielphone fee them by provided with apparatus of an b dosign that when a gun in finch this can space-train the previous of time that elapses between the recupt of the sound at their respective rations. Suppose that it were thus catabilisted that observer A hears the report two seconds before observes 18 succession waves travil some 1,150 feet per second this means that the gun is 2 300 feet mearer to A than to B.



How a gun is located by timing its report as heard at three points

If the mathematician were now called in, he would point out that the conditions 1: imme a hyperbola and that the gun is loated a in whi con this curve For the hyperbola is defined as the locus of points whose distances from two fixed points differ by a fixed amount Moreover, if we are given these fixed points and this fixed difference, the hyperbola is completely determined, and can be drawn. The mathematician would priefer to say that its equation is determined, but the artillerist goes might ahead and draws the curve, without bothering his head over the equation

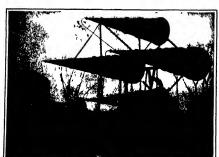
With A as center he draws a series of circles at, at, at, etc. with any convenient radii—say 1,000, 1,250, 1,500,

feet in the about B in draws another set of circumstance in the about B in draws another set of circumstance in the about B in draws another set of circumstance in the about B in the second set in a point that in corresponding circle of the second set in a point that is corresponding circle of the second set in a point that is corresponding circle of the second set in a point that is corresponding circle of the second set in a point that is corresponding circle of the second set in a point that is correctly and the second set in a point that is considered in the second set in a point that is considered in the second set in a point that is considered in the second set in a point that is considered in the second set in the second set in a point that is considered in the second 
Using the same method to determine the time-differtive between the receipt of the sound at A and at a third at time (a third set of circles can be drawn about C, with appropriate radii. If the report reaches C one second after it reaches A for instance the circles c, o, o, o,

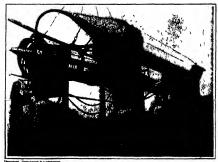
will have radu 1160 first greater the erretes 9, 5 c will have radu 1160 first greater than the corresponding radu of the earlies about A. The intersections of the errices about A with those about C give us a second hyperbola upon which also the gun lies. But every light-school student knows that if it lies upon both hyperbolas it lies at their intersection, so that when both

curves have been drawn, its position is fixed.

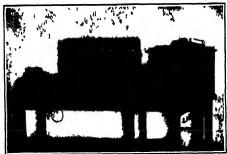
It is procedure will be as satisfactory to the mathematician as it is to the stillerist. In fact, it is the line of attack which the mathematician would doubtless.



Long-horn set used by the French in locating enemy aircraft



A British hydrophone operating on the principle of angular divergence



The phenotelemeter, for precise and immediate location, electrically, of hestile artillery by means of the sound emitted

employ if some heartless wretch were to suggest that up the sound waves that use from the projective after setting the equations of his two hyperboluse he of a hostile submarane and trust through the water setting proceeded to construct the curves. It is sufficiently the water these audible to the human car in addition to the curve.

control this feature by making the circle as close as need by Accordingly as accurate for all nurposesas come as need in Accordingly as acon as the graphical work on the problem has been completed, and the location of the hostile gun put into the language of the day for the benefit of the friendly gun we the latter can proceed to drop their welcome billets-doux upon the critical

It will be observed that in theory the method is the amplicat, but naturally there areas various difficulties in practical work. Apparatus must be in skrong make-up, but sufficiently sensitive its source societies timing. The a given sound must be distinguished with constitution of many others and the report or dictionation must be kept distinct from the sound of the shift light Allowance has also to be made for the orientation of the orientation orientation orientation orientation orientation orientation orientation ori It will be observed that in theory the practice at a comparatively (art) date— the more so because of the possibility of averaging a number of trails for the time-difference, and again averaging.

averaging a number of trials for the time-difference, and again averaging a number of indicated positions as obtained from a various combinations of last nump positions. It is method was found especially useful for locating batteries that had been sooneedlattines than the desire of casonations, or he hree at exactly the same instant a manber of guns at various range While it is possible partly to meet these and other hindrance it is not exceed to do so, and it is not possible to checkmate them altogather. On the whole the margin of error which they introduce into the work is an uncomfortable one, and the shorten detector was born in the effort to reduce it.

the electric detector was born in the enert to require it in turning to this, the sound-rangers were hardly treating united ground Always there had been cr-counstances under which the distance of a houtle outli-might be too great to permit satisfactory returns by the anded ear, or the enemy may be operating in some-ng, like an airplane or a submarine, that merely makes noise as distinguished from a report. Then it is noise as distinguished from a report. mary to have apparatus for recoving the sound, and ape for magnifying it as well. And it is immedi-found that when any extended mechanical equip-

ledy found that when any extended machinated sequip-ment is necessary for its recognice, the matter can be implified by mecoporating an device that will at least death and the second of the second control of the second control of the second control of the distance. One great he this skyle of automate count-reception me that of anti-arrents work. We illustrate a set of corns designed for the purpose by the French, and this-ries whelly usages apparetus get up by the American antipart of the second control of the second of the second control of the second control of the second of nonesthing to be desired in the line of accuracy. The tendent of upthe will tell us catagorically that the nacionarus officiency is to be got out of a parabolic undactor, not be accurate componer was following a pretty infinitely masted path-wellfield that the sound detector

in that form The particu-lar parabolic sound marror which we show will jack up the learn of a hostile an place at a distance coust to three and one-half times the greatest range of the human car it is catremely light and portable to the last degree Then to comh ppens to mumay plenes show the pertable search light which travels with the some ranging cuttits for the perpose of illuminating the period of the night and making it possible for Archir to take a shot at

them

The hydrophous is to all
initiats and purposes the
sum sort of instrument as
it parabolis dittetor exept that it works in a
denur and therefore a more
for analyse defent.



The recording tape, galvanemeter and tuning-fork timing apparatus in the absocialemeter

in one way or another, as already described in these columns it indicates the distance, or the direction or both of the source Caven such afficient aids to location of the enemy or

these it was but a step further to the utilisation of the valuable sound-detection powers of electricity One of the most effective instru-ments of the enters sound ranging tampaign was the phonotelemeter, another American development In this apparatus the dual rereption principle is again employed only here the two points of impact for the sound are so close together that without the electrical that without the electrical features of the device, no distinction could be made between the moments at which the nound reaches them. But the assembly uncludes a tunng fork which is kept in motion electrically, and its successive shrokes and its successive sproket divide a second so accurately into so many parts that it is a ample matter indeed to so oure a graphe record that ourse a graphic record that combines the strokes of the fork and the impact of the sound upon the two dis-phragms, and accordingly shown just how many thoubetween the two impacts. Thus, in combination with the well known terminds that the sound is louded stime increphone when it fills perpendicularly up a the shaphragm makes it is matter of comparative as to get up an instrument while will rever it in in minimal the up an insertiment with the west of the final matter the premise distinct and direction of any source of almospheric disturbances. In Ed. the phenotic length is reddied with having spit. Il 117h shift gains or bottome within a period of 24 feets. Il on the five mile freatheach is some able to a some all the matter and the source of the s which is cavered by a singl matrix at

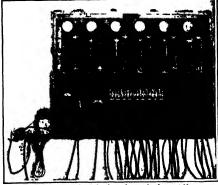
which is exercicle by a sigl constrain at the thinguist obscurate transport vasas inspress meat over other methods of being leveld period of the manily because it does not require safe systems of all The necessity for sufficient data is quit generally reducing the report that get paid of a supposed by reducing companies. The sill the daily just occurred an the springed 17 low aid a tribe effect that the Jug exercisate guar that it embrying them had be a late to the wi-cohemic latest it per constitution of the tray cleary when the shell passed through a double assume. The head-tive was gravely asked were perfectly clean can thely trameasure | with exercising care and the exact direction of their line trenters was found an I from this the I work interests were able to fed my lack the course of the shell to the mouth of the examon

With all line respect to the gentlemen who accepted this year it is if a urse in about one. If the French authoritis had had advinin notice of the fact that authority hee had art into income of the Cermon shalls was to passe this particular awaing and had then set up the usual electric device to time to the highest through the spec between the two numbers. He shall may be continued to have been shall may be a house as well set the angle of

fill and the pro essentimed in the story could then here been extract out with ment of less actuary. But in the of course nothing of the nort was possible The first time we heard it it was got up in a farm calculated to extel the wonderful alulity of the Yankie An American ful ability of the Yambie. An American aitility of hier was a perfect of as having learn trevelling along a camoulfaged road, when a shell pure i the burlay root il avi him and stur! at his feet with a third and in explose in Notwillatind-ing that his shell's refused to turn out a dud prevented the wording pathonai from even recognizing, its either and the nee-tra mith. Alouth, his discrementation its initial velocity hait once estima the angle of fall from a glan cut the hole its indict of not the councillage performed few mysterions call of these who there in his local crotches off wise not appearing and telephoned the lastion of the

Maturally this while the Paris If a nicely think the while the recent that the recognition of the recognitio

gun is to be located joingly and ac-curately sound ranging will have the used thus is the only method that makes it unnettenance know anything about the gun itself its raliber, for matance



An installation similar to the phonotoles

# Can a Safe Airplane Be Made to Sell at a Low Price?

Till airplant is an inis rently expensive machine to essentially one reads in the daily press that airplants are soon to be sold at a few hun ired dollars each or at a price comparing favorably with a good price comparing Instantily with a good mining a Butsuth it imprisare based on imagination rather than fact some on thousants writer as it seems has allowed his imagination to get allowed his imagination to retain the allowed his imagination to remain and of his which the termination of his white warming air rath manufacture is have turned.

their attention towards commercial avia-tion. Here and there small single seater tı n and two scales of the control of introduced ranging in part from the stop of \$7000 in well as length that the \$2500 to \$7000 in well as length that the passenger winged inn usines selling for \$10000 in mark \$10000 or mark \$100000 or mark \$10000 or mark \$10000 or mark \$100000 or mark \$100000

plane that is really jet tirel

Plane that is ready jet that No doubt their will seem be nicplanes on the market for as low as \$400 Lit unless some distinctly new prin-ciple of constriction is called into practice, such machiness cycle of constrict a in seamed into practice, who maximizes will hardly he safe to fly. To be really practical an ampliane must have a sufficiently powerful motor to buck strong which and must be see exerticated that the motor is ahead if the pilot. There should also in provided a stanneh lunding gear in order to take up all shocks

The accompanying the tration serves to show a form of incopensor machine which is decidedly daugerous in fact, there is nothing distinctly new about it for the mak, sitter is nothing institution we actual in a fun-reason that a very similar constitution was followed in Banton Dimmin a Demoiselle moneyplane which was flown to some extent in 1909 and 1910. In the present machine which has been designed to provide an in-expensive, arphane for the general public at well be noted that the V vilinder rigins as placed above and somewhat that in vivinder ingul is place above an each was a shead of the plot who ists in a small nacell below the wings. In landing gear consests of an aid and a pair of whitels directly fast ind to the front of the nacelle In the event of a hard landing they is absolutely nothing In the event of a first insteading there is amounterly nothing in the machine to take up the shock such as resulted. V structs as in most machine and there is nothing to prevent the taginer from reading due to he paled. The only feature in favor of this machine is its low price which is not machine and the regular machines machines of the regular.

biplane tractor design
by it fillows that an acplane can only be sold at a liw price if the fundam rital principle of safety are set and find ed it as very much found that as the public turns more and more to very day fring there will be multicous fatalities due to the me of machines that are poorly deagned and cheaply constructed.

### A "Super-Charged" Amplane Engine By Benjamia 5 Foss

UNDER the stimulus of war the net of the arriance has been marvelenusly ratended not only horsauchally but also vertrailly 1 light situte it symp has become the rule rather than the exception and we a consequence the disficulties which confront the variance in these altitudes have become actual. These deficulties in turn have been passed tout to the across matched enquence and a renow study, has anothed enquence and a renow study, has

been made with the view of solving these highly technical problems

As is well known the hunting factor to

As is well known the intering lactor so high alittude flying as the ramford at-mosphere which adversely affects the engine quite as much as the pillet. The density of the atmosphere decreases density of the atmosphere decreases progressively as one according and causes the engine to lose preser until at approximately 20 000 feet, the nagina developes but 50 per cent of its hurse-power at sea leavil. Moreover to comprenate for the lack of support offered by the ranfield have to support offered by the ranfield speed cannot be obtained on account of the lowered power of the capine. These factors determine the maximum aftitude known as in, "ceiling," of the airplane, above which an airplane of given power and load cannot rose.

load cannot rise Could the power of the engine be main-tained at these high altitudes not only would the calling of the surplane be greatly extended, but greatly in reased speed would result on account of the decreased resistance which the tim atmosphere offers age of the airplane



This single-seater monoplane is one of the latest attempts to build commercial sirplanes at a very low cost

This problem of maintaining the power of the segine at high altitudes is one that he absorbed the energies of engineers for several years, at I various methods have been employed partially to various this difficulty These have included the adm-sen of oxygen to the



This blower, attached to an airplane engine, permits of efficient operation at high altitudes

engine, compensators for the uburctor auxiliary air intakes, high compression pist ins it? At best, it may be said that these devices hav only partially solved the difficulty, and are temporary cay dust by inding the di wiopment of an engine which will maintain a con-

stant poweroutput, irrespective of altitude.
For a long time it has been recognized that, if the air density as the instance of the engine were held constant, the horse-power of the engine would be maintained. The physical processing of the engine would be maintained. physical properties of the atmo main the same at all altitudes merely a question of increasing t physi to approximately sea-level or maintain the sea-level power of

maintain the ess-sever power or to a sequent The is a question of forced draft. The difficulty of applying forced draft, at were, to the eagen has been to develop a device sufficiently large to furnish the volume of an recessary, espable of protein-ce and the required air pressure, and at the same time, light enough to be used on a arplane. Moreover, the means of operat-ne this develop has been a controlling faster. arritane Moreover, the means of one ing this device has been a controlling insemuch as variable speed is dears vary the air pressure and volume act to changes in altitudes and atmos

The mechanical requirements of this problem demands a high speed retary blower, driven by the aughent sequence and discharging its air mit the initial of the method triude, the appeal of the appeal

At the recent Acro Exposition in Madison Square agroument American manufacture exhibited a rotary blower, mounted on a well-known type of six-place sagne. This blower is the result of two years' development and test on the part of the company's engineers, and none for the first time was publishly rhown like device which is called a super-charge fan, consists of a lagh reged mixery blower mounted on the segments of a lagh reged mixery blower mounted on the segments of a far wheel, cut out of a soft bullet of set cit and endowed an a preal summum bousing. The fan is mounted on ball bearings and driven brungs a chain of grear with final best connection to the through a them of gears with final belt connection to the through a (ham of grear with man best connected to de-cagine II to operates at 10 times engine speed, ap-proximately 15 000 revolutions per minute I is stated that the fan will diver a pressure as high as 14 pounds per square useh which p-riformatio is certainly unusual in a minde stage fan of this description

The blower is entirely automatic in operation and it controlled by a barometric divice connected with the variable speed drive whi roby the air pressure is increase. (Continued on page 524)

# Pulling the Trigger by Pluid Pressure

THE (rerman has been shown up by the late war as an implantor rather than an inventor. His forte lies in A inniator rather than an investor. His forth his chang an idea from some foreign source and squeez the puce out of it until it goves up an amount of practicity which the conceiver would never have supposed he in it. And by the same token, when anyone deep committed on the contract of 
and a host of other Britah and Freuch and American inventions, but there was one intie invention, which first new the light during the way, and which Fristes newer was able to use—apparently for no other reason than the very good one that he couldn't figure out how it worked. The was a devose, weighing but a few promeds, known to the instituted as the "C. D. Clear". It was thin pare which gave to the Alihea spootly portion of these meaning and property of the country of the country of the spacety does. This devices it for from being a cens-

It e



The gear for shooting between the bindes of the propeller by means of finish pressure, showing all the working saris

falling into Boche hands on

captured planes The term "gear" as used by pilots of the air signifies a mechanical device by means of which a machine-gun may of which a machine-gun may be timed to fire between the fast revolving blades of a propoller. There are more than a few of such devices the one most used at the time when the idea first sained acceptance was illustrated in these solumns a couple of years ago, but all the rest at the fact that it is non-mechanical. The it is non-mechanical The tremendous advantage of this will be realised when it is remembered that the terrific speed at which it must operate necessitates the timing of the gear to fire accurately 700 shots a minute through a two- or four-bladed pro peller revolving 2,000 times a minute

The history of the goar is romantic in the extreme When the war started in 1914 no one beyond the novelists of perferved imagin-

atton had any idea that action had any idea that serial combat would develop to any great extent. The first plates were chivalrous fellows. A Hun fire darting past a British or French machine would wave his hand genially, and receive a cheery salutation in return planes were solely for reconnaissance purposes

States, year, today or executy season to prove a control of the co

be fired-only at right angles to the direction in which



The largest log house in the world, built as a monument to the lumber industry of the northwest coast

the machino was flying, in the majority of instances. One day a pilot took a chance and fird straigh also all through the propoler. It was a risky proposition but on landing it was found that comprisingly five of the shots had that be blade—should foun per cent to be case! It was however, superaisy as will as daugerous with propic firs conting \$100 and more. No the nax step was to armor plate the blades so that the faultets would gain call. But the threstead to put a step it formation flying because the bullets, ricoche ing in all direc-

On summer afternoon, three years ago or the cubints a flight commander on the western front was surprised to hear a Hun plane overhead rattling off bursts of 40 or to hear a Hun phane overhead ratining oil bursts oil to or No shots with surprising case. A piloit was said up to bring the stranger in, and by giral good luck he succeed. When the Hun was abot down it we also sowed that a novel contribute of role and kvers had been itted to the enginese synchronizing the firing of the giral with the revolutions of the propeller, thereby make the two days and the propeller, thereby make and to fire through the rotating blades it was at best a crude contribute, our a vast improvement over indistributed for the contribute of the con

(Continued on page 524)

### A Log House of Colossal Proportions

513

Till Am 11 an penchant for suprelatives is so well known that it can fairly be said to constitute a national characteristic our thoroughly fixed custom to take scrious notice only of things or of achievements to which the superlative can be attached to the biggest or the heaviest or the fastest or the tallest thing of its or the tailest thing of its sort we give the respectful attention of at least a passing moment—upon the second biggest or he iviest or fastest or tallest we have no glance or thought to waste. So perhaps we may without further apology ask the busy reader to pany long enough to gaze upon the counterfert presentment of the largest log house ever constructed, which has recently reached completion at Portland Ore this is in more senses than one a monumental edification since it is put up to communicate the timber and

jumber milostry of Origon, with special reference to respirat in the grad wir. It is their force most inting that it should take the form of a huga strot terre. I logs. Huge in very trait it is 200 fect long 10.2 feet with 7.2 feet high. There are 49 pillars e. is 15 feet in high. More than an influence board feet of hunder were used in the undertaking. The building is constructed allogs their C this huge fir lumber industry of Oregon.

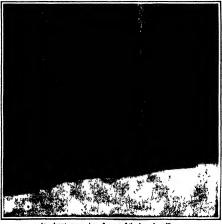
logs that constituted II. that raw material for the timergeness would infer Perlays letter than any timergeness would infer Perlays letter than any figures the jut tograph showing a man standing at the fast of one of the pill are convey as in depart impression of this size of this in at unent to the workers of the woods and their achievements

# Discovery of the Influenza Germ

A scounted to denotry by Migo II (reseme GibAs a counted to denotry by Migo II (reseme GibAs no Migo Bownian and Captain Conners of the
Allic I arraw medi als reason of what is stated to be
very probably the causative germ of influence appeared
lately in the 1 delvi Time. It germ belongs to the
old r of filter passers and is grown by the Noguchi
method. I helwayers not Major Chlemb in life, as he fell a victim to the very virulent strains of the germ with whi h hi was experimenting



The impression vists the very ball of the leg bears meaningst



An advantageous view of some of the huge log pillers

# World Markets for American Manufactures

Edited by LYNN W MEEKINS

A department devoted to the extension of American trade in foreign lands



A man-drawn truck at Shanghal

A gang of coollog unio

# The Travels of a Trader

The Travels of a Trader

"TRE of banks have traiter knak for swapping
I is not of the greatest action to extending the sale of
American goods abroad well a pronounce! Chesgo
merchant recruity 'II the min in charge of our
branch hanks in foreign countries deplay a blist of that
sort good care will be taken of our justice and interests
our fatter hismost with one third of the projet of the
world, who have in China and Russia depends upon
the development by American farms of a satisfactory
system of barter the exchange of our manufactured
acould not have various products. ods for their various products "We shall have to handle our trade with those countri

"We shall have to handle our trade with those country and with many other a just as the general store in its small town as cendincted. One customer pass for his small town is cendincted. One customer pass for his purchase with so many handles of corn or so many barrels of applies another with so many torder of wood for many visar I oward a store of that kind and my business grew into an intrinstitutal out primer because of the contract of the

his friends. You have to give him what he wants when he wants it if he can't pay cash down you have to be reasonable in the matter of credit. When you customer knows that be can buy from you anything lo mede at a fair price and that you was try to do him he will not only spend plenty of in mex himself, but also bring his freads to your store.

but also bring his fire ids to your viore.
"Why don't more American firms sook
foreign marks to? One rason or that for many
bosses like to boast of men's having takin a
vassion. I he, set too tught on the job and
grow in rather than grow up Alter 20 years
hard nork lief one of my freedes a weet and nork lief one of my freedes a weet and
my firm had not reserved a foreign
that takes my firm had not reserved a foreign
that takes my firm had not reserved. anat mine my first had not received a foreign order. We were selling goods all over the United States and in Canada but we had no overseas trade

# Different Ways of Doing The

"We landed at Shanghas and there I act "We landed at Shanghai and then 1 are John Chinaman on his native, soil II does overything with reverse Laglish 1 n nectant to writes his name Chinaman John - the summan comes first. In a Chinese book the words run hai ward according to our point of view—they read hour right to left. A Chinaman who wants to sell samething to you or buy something from 3 our invariably measts that you are a better man than he is a rober man of nuch higher thanks of the community. A number con maniand so ther man man me a richer man of nuch higher standing on the community a number one man! All of which means that you can pay the top note h price, on a cupt the rock-bottom price, according to your position as beyon it splier

be retail trade of China will always be in the hands of the China by the reasons are that a Chinaman a wur i is a kind as los bond and all other Chinaman know were in export and its bond and all other Chimanian know it while the what much has only too offers their advantage of his Chiman constanting and that individual sales are, to a small for return the large profits necessary to entirely the foreigner. I write done shop where the sales man as high as it bundered daily and yet the receipte hid not total more through 18750 on the average. The promoter thought he are done a much homes. tor thought h was doing a good business thousands of sunder stablishments in China

The vast extent of the Chancs' market makes it as unrivalled field in which to still a low praced article to insulvantal use An American oil mynary increased its ordered for simple fittle lamps each risk of a great to demand for them that does any in the groups color—1 of a great of the demand for them that does any in in Hancow offered to lake the cultum that the simple in the Hancow offered to lake the cultum that the simple in the Hancow offered to lake the cultum that the simple in the Hancow offered to lake the cultum that the simple in the Hancow offered to lake the cultum that the simple in the Hancow offered to lake the cultum that the simple in the lake the cultum that the simple is the simple in t

'In company with the reprise stative of an American machinory firm I took a train from I'vkin early on morning and journayed through North China About sluck we came to a place called blanchikan where all passen are rever done barged Nove the three were reprise or to Harbon in Manchura, as I are naturally expected to hind another train waiting jour their wave it any. No trains were operated at night on an and of the dragonal states were considered to the sands the state of the same three weeks and the same white transportation again became a scalable.



Native lighters alongside ships in Shanghai Harbor

Speaking of Chinese railroads reminds me of the failus of an American manufact ner to obtain a contract for locamotives because his I or pain competitors made a more careful study of Cliniar peculiarities. One loconetive was ordered from each of the computing loons the was ordered from each of the computing companies. In every respect sixt on the American product was unmustakably supcome. However, it had been painted back before shape of first the works and on the way across the Parch it I crame more or less traited. Its appearance, three it was lark use attractive than that of the Puropean I unotives which were painted in accordance with Clurce preference and had been touched up by the manufacturing agents after arriving in than Don't get our colors mixed if you want to sell goods to the Clun's.

At Minkels we changed to the Jupanese railways—and it was like jumping right back to the United States of Argular American passesser from drawn by an American passesser from drawn by an American

and it was like jumping right then to sho characterists.

A regular American passenger fram drawn by an American based on the state and consisting of American chair tars and the promoters and commenting or amorten chair tars and sleeping cars was a welcome ught to a weary traveler. The only difference was a Japanese porter in place of the bowing negro who angles for your loose change while

you are enjoying like comforts in the United States Schemen Philosophy

From what I mw in Siberia and later in Russia, I am sure that food as the best remdy for the present chacs in that great expanse of territory. The people are double couchi ordinarily if they have enough to live on they are quite satisfied. During the Carra regime the Russian amough ordinarity if they have elongs not rebs the sys-quite entished. During the Cara regime the Russian passants heatsted to make wheat for the tax collections took thris fourths of the harvest. When the Russians do neared in accumulating a little money they have to spend it the faster it gets out of there probests the happur they see in to b. One trader who had gamilled as any the earning of several months seemed not to be The tax collector would

away the carning so severa montan seemed and to be worrying over his numbritum. The tax collector windle have taken most of it anyway he said. That of course was before the great war. Conditions have changed since 1914 but the character of the people in the sain. Much of the trade throughout ditions have changed smom 1914 but the character of the people in the name Much of the trade throughout Russia was carried on by derman lirms prior to the war. The commercial language in widest use as German When order is reduced in the widest use as German When order is reduced in the widest use in the second in the United States. The Russian products to be rodd in the United States. The Russian

to be sold in the United States. The Russian increhant will not for a long time have well-start apital to enable thin to but American alore it is assay to be for Fingland factory. Ihim the last of a medium of exchange, must be running to the start of the start of the start mental to the start of the sta

As the result of my trip we organised an at the result of my trip we organized and export department is guinning our sake cam-paign in the countries that I varietd himself the uther members of the firm have gone to other parts of the world to get a line on markets and methods. It has been our polery to see for unreviews and find out what a what before attempting to enter strange fields You might call it the 'general store system applied to foreign trade—knowing your customer giving foreign trade—knowing your customer giving him what he wante and swapping if he'd rather swap than pay cash. Our foreign agents take

the bartering part of it

# Selling Woodworking Machinery Abroad

"THLRE has been a lot of talk about the vast number of temporary dwellings required to shelter the home-less people of devastated northern France and Belgum," remarked a machinery manufacturer "It has been asid less people of devastated porthern France and Beignum, rumaried a machinery manufacturer "It has been and that a great deal of woodworking equipment will be needed to turn out the such, doors, shinds, flooring and other parts of these houses A representative whom we ent to Europe informed us that the British and the hreach makers of this sort of machinery will probably obtain most of the business. American woodworking apparatus has been criticated in England because of his lightness, machinery obtainable for American wood not always being suitable for British wood, such as eak, elsa, and planing machines are bung und by Records wood-working firms. American small tools of many hinds, medicing chicks, gouses, saws and planes, are resultd in every important shop.

## A Bridge Without a Trace of Metal

THE natives of Java have a bridge-building technique which utilizes to the insit their slight resources for work of this character. Of raw materials they are acquainted with but two, and one of these is really a product of their own ingunity. They have no nails, no iron, no true wood, they are forced to rely entirely upon bean-boo for the structural parts, and upon a rope of their own manufacture to effect the junctures. In spite of these limitations, they achieve highly oreditable results, as the photograph reproduced

berswith will go to show
This picture represents a bridge over a river in the central part of the island. The mean is almost 150 feet, and the width of the readway some four feet. The four of the readway some four feet. The fear bamboo columns at either side of the stream are built up of a double length of from 50 to 60 hamboos, tied up with rope and firmly presend together by forcing a quantity of wedges between rope and bamboos. Such columns are found to be of romer/shable strength and elasticity, trength and charactery, in fact, used throughout the Dutch Indies as derricks for lifting roof-pans when building sugar factories, etc. The original element which the Javan matives have brought to the construction of

matters have brought to the essecution on these budges, as reinarked, as the rope That is made of a flort takes seem the nature arca-palm, which grows all over the masset. This floor, as shown by a sample placed in our hands by Mr. T. Karthaus of Egenar, fave, as of a black and herry substance & sequint, users, so to back and notify successful was maken arope that results afterirely the heavy decaying action of the hot and damp treptical elimite with its legions of fungi, in fact, it haste for many years without any indications of rotting. So between this rup, and the bamboo, the natives are able to achieve a semi-permanent structure for whach at would be hard to find perminent students to what would be made that the same as peer on the ground of discipences and durality. Ferhaps the most surprising feature of the whole thing is the degree to which has been appreximated the best type of bridge are. How done as agreement savage knew that a bridge ought not be best performed finite. type of bridge arch

# Beauty and Utility Combined

Beauty and Udiky Combined
I does not often occur that beauty and utility can be
obtained advantageously. But in Golden Gate Park,
San Francisco, Cal, there have been coveded two outsides
advantageously. But in Golden Gate Park,
San Francisco, Cal, there have been coveded two outsides
and the control of the Combined Combined Combined
and the Combined Combined Combined Combined
for hundred freet from the Badir Ocean, evolve a large
sent of the time, particularly during the summer season,
when the winde are invariably strong along the coast.
The water pumped from the ocean is used for irrigation
purposes the sugglout the park, and also replenables the
summerous lakes watered throughout the famous
recreation center. As each of the four planes of the
reviving whead of the winduli is shout 40 feet long and
seven foet wide, she energy developed by the wind is
coerroous. It has smothed of pumping water for irrigaties purposes is not yet common in California but the



A bridge built by Javan natives with no materials save bamboo

success of the experiment an Colden Gate Park makes it tured in Europe from Brazilian woods appear that the idea may well be copied elsewhere



Windmill of pleasing outline in a San Francisco Park

# Furniture for the Tropics

FURNITURL as well as other wood F pr ducts used in the tropics is subjected to the attack of insects known as termites This att ck is excessive in South America in the coastal regions north of Rio de Janeiro and is so certain and so severi that in the pin it of the Lorest Products exporting we denfured in to those regions unless the word use I is naturally resistant to termites or is treated with a poison to prevent the attack of these insects

There are a number of species growing in Brazil and other tropical regions which are naturally minimum to termite attack are naturally infinite to termite attack and which are used in those countries almost exclusively for the manufacture of furniture. Nome of the cabinet woods which grow in this country, however, possess such immunity

possess such immunity
Of course in order to compete with the
furniture now used in these regions the
linted States product must be equally
durable. One way of making it so would be to import cabinet word from the region in question make it up into farniture here, in question make it up into infinite leave, and return it. A sumil repractice appears to have been very successful among Luropean furniture manufacturers before the war when much of the furniture sold in Brazil is said to have been manufac-

tured in Europe from Brazilian woods
Another possibility that may be considered is the use
of some of the cheaper domestic furniture woods for
backs and cores after thorough impregnation with a poison such as mercuric chloride and the use of Brazilian termite-proof woods in the form of veneer for facing.

# Totaling Victory Loan Subscriptions on a Monster Adding Machine

PERHAPS the most novel of the many ingenious DFIHAPs the most novel of the many ingenious mechanical and picturial devices used throughout the country to stimulate interest in the various Liberty Loan campungan was the giant adding machine on which Defroit kept a record of the Victory issue subscriptions. This machine was set up on the front laws of the city

half facing the busicst section of Detroit. It was 22 feet wide, 31 feet long and 12 feet high and reached a total height of 22 feet at the back due to a raised base which

tilted the big machine forward.

The keys of the monster calculator were about a foot diameter and had the appearance of lunch counter ools A hidger page 20 feet wide and seven feet high was shown in the carriage—and the entires on this sheet were changed every day during the weeks of the loan. total substriptions also were shown in glass panels at the front of the machine, representing the dials of the ordinary adding machine

Detroit went over the top the first day with total pledges of \$63 159 150 and before the ampaign was over pledges of \$63 159 150 and before the ampaign was over the adding capacity of the giant 0 column machine was taxed almost to the limit—I lood lights illuminated it at night and hilped to make it a most successful means of sustaining interest in the loan





Giant adding machine on which Detroit's Victory Lean subscriptions were totaled. Size of machine 22 feet wide, 34 feet long, and 12 feet high

# The Motor-Driven Commercial Vehicle

Conducted by MAJOR VICTOR W. PAGE M S A. E.

to the interests f preport and prospective conserts of min trurks and delaway seasons. The older will endouser to answer any questers reliting t mechanical features expandion as t management of commercial motor soluction

# Extension Rims for Sand

THE ordinary solid rubber tire used in motor trucks as a very satisfactory which tread for hard roads but it does not have sufficient area to loop the which from cutting into sand or sett soil. The from sutting into sand or sett sou. The device shown in accompanying illustra-tion is a simple containing that c n be attached to any truck at all to provent attached to any truck all of to prevent loss led trucks from at this, d was a still reads or fields. It is not in Robinson Crisson should sudder by use a specific property of the tracks of a "said growsor — quipped, Caltorina orbit of the tracks of a bear of the deart island, he would undeabt dily wrinkle his brow in perplevity and sek linaself what manner of machine this gould be—for the tracks. ple ut) and set immel' what manner or machine this could be—for the tracks would be neither those of an ordinary truck nor yet of a tractor. In die pur-pressions would have almost the levi addi-of tractor drive which but they would of tracture drive which but hely would be also of two depther after on the sands of progress—and the desert issues and no progress—and the desert issue and no progress—such the desert issue and the sand the san of the orchard the growests remforce the true doubling the soil resistance and traction surface. The rear rim exten-sions are furnished with sand lines to give some are furnished with sand lines to swe added traction when the going be comes hard and leavy. The auxiliary rines clear the road by several inches when traveling on a smooth highway. Trus ke so equipped collect the fruit in the orchards (the truck in the illustration is orchards (the truck in the illustration is bringing out over 4 000 pounds of cranges) and later haul the packed crates to the city markets Mr 7 Raysolds, a heavepaper man, a fruit grower of La Verne, Cal, is the owner of the annul growser" reinforced truck shown

### Electric Tower Wagon for Trimming Street Lamps

THE electric lamps along San Fran-cisco's brightly illuminated Market Street are kept in order by the aid of a specially devised tower truck built by specially devised tows truck built by gas and clerts company for its own use. The uppermost lamp is about 18 feet above the adowalk line. It is accessary to have a type of trimming devise whereby a man can work asfely and quoisly on the lamp. The use of the magney as concaved by Mr B J Laborger, engager for the company, from a short tower wagon used for two company, from a short tower wagon used to working on their owner to be used to b

only necessary to develop the collapsible lift for three sections as against two to increase the possible raising height from 21 feet to 25 neign from 21 for to 25
This tower is monated on
a one and one-1 if (1)/) ton
electric truck. The battery
that drives the wagon is also
used to drive a motor that
raises and lowers the plat-

form.

'Since the photograph was taken the company have mounted a vacuum cleaser on the platform which is also driven from the battery installed on the wagon, which



Motor truck equipped with extension rims to prevent wheels from ginking late sand

tic tower might sway to a point where it would be dangerous

vacuum performs the function of drawing the magnetic dark given of by electrodas while the lamp as burn-ing. It was found that when the workmen en-diavored to left the dust pass out of the lamps the wind blive the magnetic dust all over the podes-trans so the well known you que nicesary was put Varuum (leaner was put

to a new use

It will be noted that
the platform is mounted the platform is mounted on a ring so it can be revolved in any direction, furthermore that the railings on the platforms are collapsable. This battery gives ourrent enough for testing the lamps on the curcuits. The tower is provided only the provided of automatically when it gets to either its minimum fold or its maximum lift. The truck weighs four tons an the springs are bolted down so as not to act, as down so as not to act, as the tower at contrain places Sectist truck seed for trimm Market Street where many street tamps are sharp, often etands at an angle of nearly with the first else the street when the surface and if the springs were free, this important work

hi sway to a point where it gerons

On the top of the upper gertions of the towar is a platform from which a horsential extension in the horse shows the tower in use in Market Street The bat-teries are recharged for four hours daily one hour at noon and three hours at night A second tower truck has recently been truck has recently been placed in operation to care for a lighting system ex-tended throughout what is known as the "Tranagle District because of the auccessful service obtained rat electric towar truck in

Long Distance Motor Transportation
THE problem of good reads is only one
part of a larger problem—temperature.
In the necessary to state this abvesse the obvious as usually the last thing we were
The other humber received the obvious has to make the obvious as usually the last thing we
The other humbers of the other of the obvious has resolved teeff into the obvious has resolved teeff into the humbers of the obvious has resolved teeff into the humbers of the obvious has resolved teeff into the humbers of the obvious has resolved teeff into the humbers of the obvious has resolved teeff into the humbers of the obvious has been described as the obvious has been described in the obvious him has been described in the obvious of the obvious has been described in the obvious of the obvious has been described in the obvious of the obvious has been described in the obvious of the obvious has been described in the obviou Long Distance Motor Tree

modern transportation problem
In addition to the unlimited to

incident transportation problem

In addition to the unimed use of motor trucks for delivery purposes, they are substituting for railroads where the railroads themselves are using them to replace spirin, which are usually a source of expense and difficulty. Also in interactive shipurcate large truck companies to the series of the series

Sect of motor trucks and delivery direct to consignose or to warshouse to be held for future delivery to New Lagland, New Larsy, Delivera, Pennsylvians, or other saboard states or to trans-Atlantic plers in New York to the control of the interval of the saboard states of the mability of the reference of the mability of the reference of the mability of the reference of the press of the reference of the pressure of the reference of the reference of the first of the reference of t

which have congested railway traffic m all parts of the country. This condition is responsible for the distovery of the real value of the motor



A train of large tracks engaged in long-distance hould



# The Service of the Chemist A Department Deceled to Progress in the Field of Applied Chemistry

Conducted by H E HOWE Chemical Engage

The (ompetition in Poisson Gas

Till kind of competition to which we have become secuntomed between pro-

1 118 kms on companient to want wo have represented to the see projection as in summer also cause between projection as in a summer also cause between projection and off rare in the see that the see in the see

Romas h m offense was equally success Resear h to off nar was equally successful and although therers was may primed and by gin on the public in comparatively late in it day she as as will in the lead at the cless of active headthins not only in quantity productions of draidly guests but in now developments and surjenses about it his spring. One of these new gazar has be sprung Om of these new gases has been described as a super-purson gas and had properties sufficiently wonderful with the properties of the pursue of these

out the accessity of thinking up others with whill to emi-climb a popular story The success of a gas attack depends in a great me asure on surprise ck ments one of the greatm saure charpens (a une moment unportant of which as the use of a new gun against which the enemy has imadequate protection or a gas similar to those already in use but capable of producing either higher concentrations of producing vither higher concentrations of loos vaps to much more tour conductors per unit which amounts to the same thing. Now the last American gas produced in comment of the same thing of the first things to the same thing of the same produced in the first was a great many more, times at footir as minister gas and it chapted to the same put rail class of puons gas. For example in order to produce the distriction of tiesue maintain gas in raily a think highest haid to come, and to contact with the same in the same increase in the same produced the same times and the same times and the same times and the same times and the same times are the same times and the same times are the same times and the same times and the same times are the same times are the same times are the same times are the same times and the same times are the same time liquid had 15 conx into contact with the country is its stamulate associative and man will dithrought gross when the gas a poration in suck receased with the gas poration in suck receased without any was private in small drops or otherwas: interferent with independent effort and became expressed to x With the new or original work. In its immediately will be manne surf of effect was produced by societies many regional organizations, and individuals for all sections of the quintry character of x port in the air and in and individuals for all sections of the societies many regional organizations, it is quintry character that are missard country shouse on their menta for the work it is quintry without that as a toxic agent it. was greetly superior

bo far is is known officially our chamie So in we is known uncoming our commissions were user pared to must this gas and even if they lied have a special absorbent in their gas must consist or disgond to take out this new person because if they are uncomplying commitments they would still find protection if the body against the vapors a very lifticult matter. We have reason to believe that American accounts deto ments that there as status de-should be a comforting thought in view of the p solubity that in another war gas will be its important weapon

# The Stimulation of Research

Cord War. The leading representatives in warnous fulds of attentific undexver, to the number of 50 were brought together by congressional charter and they gave what ever and they could toward the solution of the many scientific problems which confronted the ministry establishment. That charter stipping to the the charter stipping to the the charter stipping to the charter of the government, savestigate, camma, caparises at and report upon any of such investigations, coammations, experiments and reports to be paid from appropriations which may be made for the turpers, but the Academy shall recover no companisations which may be made for the turpers, but the Academy shall recover no companisation what we for any service to the Government of the United States. to the Government of the United States

to the Government of the United States
On numerous occasions the As ademy has
serve of in such a capacity and in April, 1916,
offered the Proudent its services in organising the secretific resources of the
country In accepting the offer the
Academy was requisted to secure the
cooperation of all agencies, governmental,
educational and industrial in which research faculties were available. The organisation required to execute this cominsuon was composed of the chiefs of
technical bureaus of the Army and Navy,
the head of government bureaus engaged in the heads of government bureaus engaged in research men from educational institu-tions from research foundations, from industrial aboratories and various en-gineers and consultants. To this organisa-tion was given the designation "The National Research Council" and it also National Research Council 'and it also served as the Department of Beener and Research of the Council of National Defense In Formation of the National Research Council was in itself an indication of what spin dud coupstation could be had, for the 'teach my is a small body of mon to what is some 15 may be added vearly white the council became a large organization calling in whover, because of special training and experience, account of the propose of the National Research Council is for stimulate accounts as the stimulate accounts and the source full counts as the stimulate accounts as the stimulate accounts and the stimulate accounts as the stimulate accounts and the stimulate accounts and the stimulate accounts as the stimulate account as the stimulate accounts 
What was done during the war to justify the existence of the (ouncil and its per the existence of the Council and its Drymsons principle tried to get things done and while no laboratoms are maintained there are numbers of instances where its members conred on important work to successful conclusion in their own laboratories or joined forces with others having unusual jouned forces with others having unusual faulities at hand. The Countil had a hand as originator advisor and hisper in many instances where it would not claim credit for what was accomplished, but a few examples may illustrate the types of problems met.

The Simulation of Research
The surface that the same and the street of the same and the same and the same and the same as the To minimise the duplication of effort



# The Power Stream

Bosch Magneto Ignition on Willist of specifications identides a product as one made mo meet your service requirement - not a price. The summation of years of supreme service is found in every part of every Bosch Magneto. The Truck, Car or Tractor that is Bosch Equipt has a smooth, flexible power stream, always reliable and enduring in its economy

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described their work and their plans for metallurgy, mechanical angineering, a the future to conference arranged by the tried segmenting and prime movers. Commit and intensive work began at problems were deviewed and numerous four points. Eventually the personnel inst would include morease of power needed several handred men and wonders the devices developed give procuses of the devices developed give procuses of becoming invaluable in navigation, on such as self-half in furnace and optiming and saining in fog, a curinit distribution of approach. A control of the beautiful of the control of the c

The Division of Physics, Mathematics The Division of Physics, Mathematics Astronomy and Geophysics dealt with 70 major problems. It altermined for example the pressures and velocities internal and external due to the dash brigge of large guns. Accurate date were obtained regarding the pressure, waves about guns of infferent caliber and curves plotted with the pressure with the control of the pressure with the pressure wi indica ing the sones in which our own no would be comparatively safe from shell shock. These pressures ran up to nearly 400 pounds per square mek at certain noints and the value of the plottings is

Amustante was also givin on range Assumance was also given on range inding problems which grow in complexity as the range of modern artiflery cimitantly moreases. Targets are often beyond the horison today where in the Spanish War the scales on range-haders ran up to litth more than 6,000 yards Decided improvi-ments were made in optical range-finders and other methods of range-finding while the sound-ranging service by which the enemy's guns could be so accurately located was initiated by the Council and

located was initiated by the Council and widely used by the Engineer Corps The Chemistry and Chemical Icch nology Dynamon had 40 problems assigned to it. The Division acted as a sort of clearing house and strove to bring together the problem, the best man for its solution and the laboratory affurding the best of these problems could be handled in our or more of the industrial and academic laboratories already established while others required such resources as only the govern ment could command and a Chemical warfar. Service organization New ap-paratus had to be invented to meet special needs unusual organic chemicals had to be meder and specialities such as anti-dimming its duties under six main headings. Since made and speciation size as and direction materials for glass were demanded. I have division afforded advice and was instru-mental in bringing the best the country. had to hear in all such matters for example it may be recalled that early in the war serious trouble was experienced the war a restar touble was experiented with primers. No through a ring study of primers had oven but made along physical-oh mixed lines on unvestigations were started, the purpose bring to work out tests and specifications so thante that maximum a flict new could be assured. This was a stomplished and proved of utmost vulue flightly, the time between the pulling of the floated by the between the pulling of the floated of the country of the pulling of the floated is one tan-thousandth of a second. Then there were such outstances as clear.

Then there were such questions as clear coal for gas masks, detection of small percentages of poson gases, the toucology of gases, fuels for motors and difficult problems in coramos and refractories l mation of atmosphera mirogen called for a special committee which conducted ex tensive investigations into all phases of the pitrate gituation and was of material the intrate situation and was of material and to the government in connection with the great Alabams plants of which mark will be said at another time. The explosive committee made a certain remarkable long distance star shell a success through the perfection of a proper ignition system, while new syntheses in the manufacture of new drugs reduced the cost 70 per cent.

ont
In a war of engineering that division of
the Council was, of course, deeply engaged
It had 14 committees at work and maintained closest cooperation with the great used closest cooperation with the great to said in the solution of unear process or generating concerns representing mining, generating receives representing mining, such as the second of the conference as of the generating as and ovid conference as deshiral information at bosses and all as the Engineering Foundation. Its abroad, in cooperation with governmental or through we did the second of the second

problems were diverse and numerous A list would include increase of power of sero engines at high altitudes when cargingtons aero enganes at nigh sistuaces when oxygen becomes more and more rare carburetons the measurements of high temperatures such as steel baths in furnaces and optical glass in posts electric welding of ships parts new types of guns and of helmets, the

The work of the Division of Agriculture and iclated sentines was principally that if and triated attracts was principally that in increased production conservation and sobjectation. The charman spin half has turn with the food administrator. Activities extended all the way from tribuser and such feeding studies for in-erasing our preduction of foods to the victimization of ro kines as one way to

extermination of ro into as one way to keep farm produits after harvest Never before has gology and geography played as important a purt in war, even though mush of the work was electional Manuals were prepared on depography net teorology, multiary geology as of the Luther a special produits of con-tinuiting materials are presented as the tention of clusters are considered as the content of clusters, nodes could have been system of military roads could have been built from Maint to Hords. This in formation was used later in relation to the loubling of concrete ships

And so the record continues through important work on the part of medicine and related sen ness where the cooperation and a lated sen noss where the cohparation of 12 national societies was secured psychology which developed tests whereby 1 600,000 of our troops were rated in an effort properly to distribute our brain power and human material work for the televal I radi Commission and assistance in the locationage problem in connection with enomy patents and the Patent Committee which is continuing its effort to suggest improvements in our patent system.

In two years the unfulness of the Council created as a war service body had been so conclusively demonstrated that on May 11th 1918, the President mented an mentive order requesting the Nation Academy of Sciences to perpetuate the National Research Council and outlined both by those whose cooperation it seeks and those who will materially benefit from and these with with materially included the this cooperative work we quote the follow ing managraphs from the order dealing with thi work to but arraid on

I in general to stimulate research in the mathematical physical and biological sciences and in the application of these much es to engineering agriculture, medi

time and other useful ratio with the object of increasing knowledge, of strengthening the national defune and of contributing in a ther ways to the public wilfar.

2 To survey the larger possibitive of serious to formulate company the nance projects of rea unit in develop affective means of utilizing the screenful and technical resources of the country for deal time with them provides the contract of the country for deal time with them provides.

ing with these projects

3 To promote cooperation in it scarch
at home and abread, in order to secure
concentration of effort minimize duplicaconcentration of outer minimize outlines, tion, and stimulate programs, but in all endperative undividual nutsative, as funda agent at to individual nutsative, as funda mentally important to the advancement of

4 To serve as a means of brug an entrange of the state of continue and foreign investigators into active icoperation with the scientific and technical services of the War and Navy Departments and with those of the civil

Dopartments and with tubes of the government of securities 5 to direct the attention of securities and technical investigators to the present importance of multiary and industrial problems in countextion with the war, and to aid in the solution of these problems by



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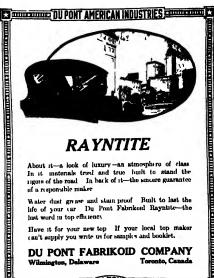
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# Gas Engines and Producer-Gas Plants

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integral of the reading and the services of the
tages are fully described.

Be formed then book entered in an edition are for a resident of the first fair of the control of

The lackefeller Toundation has already requested the Council to submit a plan for the simulation of research in universities and cillings and their augustions for National Research I ellowships was accepted. I we hundred thousand dollars has he in we assist to be expended in five years for it followships when by it is hoped easier in all men who are about to receive their increase or have just taken their activations of have just taken their control of their increases of his possible to the control of their increases and their increases and their increases and their and increases and their and increases and their and increases and their a preparal to work most efficiently and besome unfirmed in reasersh About 30
apply stome have been considered and sax
fells csipps awarded thus far. Three of
these are in chemistry and the others in
play to The administration of these
follow-layer in the hands of the Pellowshap loaned of the Council and it is somfalls that apprited that through the hearty
to the control of the material times choose by coup cition of the metititions chosen by that llows gri it things will be accomplished for where our educational in our educational institutions

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in that rate the same power of science which has set amazingly increased the production capacity of mankind during the past century will be applied again, and the price of industrial and commercial leadership will fall to the nation which organizes its scientific forces most effec-

# The Pioneer of the Trans-Atlantic Liner

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After a comowhat protessed str

Bagish port, the "Bayessedh" va

James undertaken under the same general
plan of organisation as its war work was

denn en creditably—that as by develope

appended by the president of the Aresuperment by the president of the Aredenn en from the inductors and those
from our educational institutions, all

manule is nevering for a limited time

The Rockefeller Toundation has already

requered the Council to submit a plan for

the visualisation of research in universal

After a comowhat protessed by

After a comowhat plan for beauty

After a comowhat protessed by

Revannah
Agrocably to his promise to President
Mouroo, Mr. Starborough ordered the
"Seavanah" to Washingston in Documber
of 1819, hoping to dispose of her te the
government Faining to do this, her stease
plant, which had one \$5,501, was removed
in January of 1830 and sold for \$1,500,
and the craft was open-ted from thence us,
until she was wrecked in 1502, as a saling-

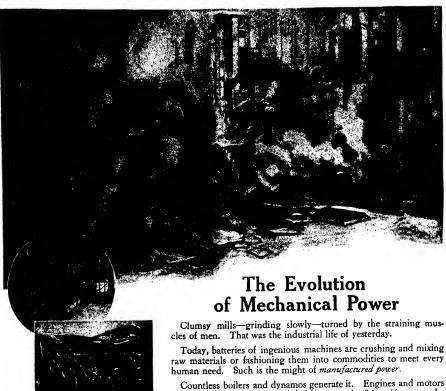
until she was wrecked in 1822, as a saling-packet between New York and Savannah. Her entire cost originally was \$80,000. Although the "Savannah" did not make the whole distance from Savannah to Ireland under steam, her performance heartened others and undoubtedly has-tened the day of the trans-Atlantic liner. heariened others and undoubtedly haslened the day of the trans-Atlante liner.
Regular steam service between Buropes
and the United States was not, however,
inaugurated until 1838. Then the British
steamers. The state of the State of the State
steamers. The state of the State of the State
steamers. The "State of the State of the State
State of the State of the State of the State
New York within a few hours of one another
in the latter half of April. The "Struss"
crossed in 17 days and the "Great
Wostern" ande the trip in two days less.
The "Struss" had engines of 230 horsepower whale the machinery of the "Great
Wostern" was of 750-horse-power. The
"Great Western" averaged 82 miles and
hour and consumed 655 tons of coal on her
westerned voyage. The today
westerned the structure of the structure of the
attendancy nature of the explicit of
the "Savannah" and the courage of the
pople who stood by her Despite the
fact that she did not achieve all that was
reprocted of her abe did, nevertheless,
dominatrate that it would be practicable
to build a erat that could travel under
steam across the broad Atlantie

The Fature of the Arthaeologist in

# The Future of the Archaeologist in Mesopotamia (Continued from page 506)

(Consistent from page 500) country. That is the reason why the great modern numerous of America positions and amount of the first and those few have been smagged through the Turkish custom house. That too is why in our numerous most of the objects are but reproductions of the originals found long ago. That also explains why in this country where is little popular interest in things amongs, and why it is generally believed that all things worth discovering laws already been discovering.

The Pioneer of the Trans-Athantic productions of the originals found in the control of the contr Some of the impulsion of the impulsion are carrely perceptible above the layer the pinin, others size to the height of I favt. The oldest of them cover the cit of the functions and Ballylonians. Oth come from the Fernkan, Parkhins or or Arabic times. In them are buried tenants



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# Broderick & Bascom Wire Rope



Mesopotamia

(Continued fr m page 520)

so me ay and so great that the museums of the while world could not contain them all I ver in the level plain ancient objects I am I whenever the natives dig for water er plow the land and where none would think of seeking. A ligns River boats in reached out his our to push his but in marked out his our to push his but in mth. short toward which the curret was carriing him. Sudden's li-sum extrain of gold flow down to the water edge. He bud his an earliera pol m whi i someone at thousand or more years goe had burnet his wealth. De Suit the Iran it Consultar Agent at Buse h went showing along the shore of me year and On the summer of a an ent curd On the summit of a low mpr meang mound Tello he saw a large stime statue of an ancient Babylonin ing Later beneath the surface he i u l a dezen other similar statues, while ire now in the Louvre lor this discovery he was raised from the rank of consil ragent to that of an ambassador and a granted a arge fortune by the Ires h government. Near th. Arab en-Irs is government. Near th. Arab co-compount of this is a small mound called Drk1 in that I visited at and decided. Drk1 in that I visited at and decided that it ould be no fluing but the run of a mul i it guarding the canal. A little later the visit as verial binaryled, thousand, ma-mous is verial binaryled, thousand, ma-mous is verial binaryled, thousand, ma-mous in verial binaryled, the sum of about 1250 lt. C. has set be source of noars of the small clay tablets in the missings broadening America. At the museums throughout America. At the outbreck of the war some Arabs south of Babylon were digging for bricks in a mound so am II and low that the explorer thought it unw rthy of notice. In it they discovered mor than 20 large clay extinders, cash in seri! I with about 140 lines of fine writing ly if great Nebuchadacter. There he tells I who built the walls of Babylon which we one of the seven wonders of the world and how he restored the old temple which is sometimes called the Biblical
I wer of Babil Once while walking
over a low mound near Kut-(1 Amara on the ligits I found ancient Harthun copper come so thickly senttened on the surface them they were corroded and less but they indicated what may which is not they indicated what may some day he found down in the protecting clay of that mound. The work of the archi dogist in Mesoputamia has hardly begun and centuries will pass before it can be completed

At last the furkish I maire is breaking

up At least Mesopotamia has been wrested from the obstructive Turks and this wonderful ari hacological field promises to be obsured to the explorer. When the took control of Fgypt a new impetus was given to the study of the ancient civilization along the Nile Instead of obstructing the work of the excavator, they encouraged him in every possible way Scholars were invited to I gypt and any-one with the necessary qualifications and incare has been permitted to dig wherever he s uld In Caro was constructed a ne ii iiii in Carro was constructed a great uniseum when the scholars from all the wild may study every detail of ancient Egy jiam ble. The I gyptian government has iccu exceedingly liberal with the ex-caval r permitting him to take from the country all duplicate objects or whatever was 1 st desired for the Cairo museum Thus I gyptian antiquities now form a part of the collection of every museum, and the interest in things Egyptian has become

widespread What has taken place in Egypt will also take place in Babylonia. Already steps have been taken to promote the explorations of the ruins An American school of archaeology has been projected for Bagdad beveral expeditions are in formation to go swith expections are in formation to go to the most promising of the buried rities. Probably in Bagdad will be erected a great museum where the most valuable of the treasures will be stored and made accessible The Healt digiting by the Arabs will cease. for the traffic is an-

The Future of the Archaeologist in tiquities and the smuggling of them from the country will no longer be possible. The excavator will be allowed a part of his discoveries for his home museu From the Babylonian and Assyrian r o far discovered we have but faint glimp

so far discovered we have out in....
of what may yet be found
Another obstacle in the way of Babylonian exploration work has been the difficulty in reaching the country. No in-liabited part of the world has been more macressible. The long journey overland from Damascus to Bagdad required nearly a month of the hardest desert travel The longer way by water from Bombay up the Persian Gulf and the figns was so very expensive in both time and money that the tourist never ventured that way Now Bagdad is all but connected with the Mediterranean by rail, and the journey once requiring a month may be made in less than 18 hours

Still another obstacle has been hostility of the native desert tribes. All that will soon pass. The explorer who nostility of the native itesert tribes. All that will soon pass. The explorer who ventured into the interior, even when guarded by Turkish soldiers, took his life in his hands. Sometimes he had to fight his way or buy his safety with gifts expeditum to Nippur was broken up by the shooting of an Arab horse thief The the shooting of an Arab horse thef The German work at lears was closed when an Arab workman was killed Nearly every expeditum lase cost human life Now a railroad has been built along the Tagris, other lines will reach into the meeric like the second of the result of the second of ragatel and converted to farms The face of the Furopean, which many a Meso-potamian Arab had never seen before the war will be familiar. The native district will disappear and the desert will be safe

The methods of excavation will probably change as l'uropean influence spreads over the valley In the past the work has been carried on in a most primitive manner. The men have been ignorant of any kind of labor Then tools were crude and of local make The American pick is too licavy for the Arab to handle The shovel is a mysterious and complicated matrument and nothing is more amusing than to watch an Arab in his vain efforts to gui ic a wheilbarrow. The men work in gangs of ninc. The head of thi gang is armed with a small line armed pick, almost a toy with which he loosens the dirt With him two men with short-handled baskets, and the other six men with the baskets, and the other six men with the baskets of dirt on their hips, slowly dance and sing their way to the dump. The and sing their way to the dump 1 in future exeavator will adopt more modern methods. The Arabs will be trained for their work. They will use modern im-plements, and the dirt will be taken to the dump by rail

A generation ago the study of archaeology was bardly regarded seriously delve among the ruins of the past sec to most people a useless thing to do to most people a useless thing to do The archaeologist was a fossil as old and as dry as the things he would discover The archaeologist of today is a scientist trained for years by the study of language, history and art He is a practical man for history and art He is a practical man lands and deal with aswage tribes He is no longer the fossil he may once have been He must have the gift to touch the things long dead, and to make live again the long forgotten civilisations of the remote past Mesopotamia once more may be developed to feed all the world with grain No less valuable will be the archaeological discoveries made possible by the British possession of the valley

# Mobilizing a Lady Bug Army to Fight the Aphis

(Continued from page 507)

and the thousands of acres of grain infested and the thousands of acres of grain intersect with aphids last season, the task before the beneficial forms and the numbers of them required become apparent" In cool weather, as has been said, the

bugs are comparatively mactive.

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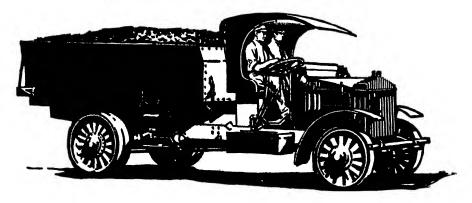
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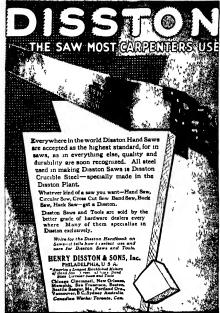
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# Mobilizing a Lady Bug Army to Fight the Aphle

ed from page 522)

Reproducing from eggs, they need warm temperatures to dovelop The aphis is under no such restrictions To quote this

same authority further "During the late autumn sexed forms of aphids occur and eggs are produced. These oggs hatch in the first warm days of spring The sphids hatching from mature in about 12 days and are termed stem mothers. They are wingless and have the unusual ability of giving birth to living young without sexual intersourse. They reproduce at the rate of one to sever young per day, the progeny maturing in about 10 days and in their turn giving birth to hving young at a similar rate the forms occurring during the spring and the ferms occurring during the spring augment months are these against females, capsile of producing living young. No true a viorus occur. After a few generation in the spring both winged and wingless form a occur. The winged forms frequently fly t new fields and set up colonies there

"It carly summer most aphids occupy ar 'alternation - of heat plant Migratory winged forms occur and fly to some new host often entirely unlike the spring host flues to the loop and constitutes the de-structive hop aphis. This habit affords prote tion from their natural enemies these nugratory forms may set up new color as in situations where the enemy is absent About 14 to 16 generations occur during the season 'Fall migrants occur in life autumn. These return to the host plant the species occupied in the spring Here true sexes are produced and eggs

deposited

1: m thus it may be seen that the men in charge of the lady bug experiment are facing difficulties of considerable magnitude These difficulties are increased by the fact when artificially handled there is considerable mortality among the bugs, In spate of this it is hoped that artificial on trol will prove effective, particularly in the dier climate of eastern Oregon and eastern Washington Experiments along cast in washington Pryperments along the same line are being conducted in California by the Horticultural Com-mission of that state in conjunction with the Bureau of Litomology, and with grafifying results it is reported

The experiments that are being made off in California and Washington will be wat had with interest by scientists and by farmers who are anxiously awaiting any me ins of destroying this serious menace to then crops

# A "Super-Charged" Airplane Engine (Continued from page 512)

proportionately to the an density ower comer into operation at a low altitude and gains speed gradually until altitus at approximately 20 000 feet altitus fhe power of the engine, whill would be lost through change in itmospheric density, is thereby re-

It is interesting to compare the results achieved with this device as against the results without it. The engineers supply

results without it The engineers supply the following spenficant figures. The engine shown in the illustration on page 512 weight 459 pounds, and is rated at 210 horse-power at sea-level At 20,000 feet all titted, this engine normally develope about 100 horse-power. The engine with pounds and develope 210 horse-power at sea level At 20,000 feet altitude, however, the horse-power remains the same, analey.

The superiority of the first so, the second at 20,000 feet is re and should be noted. The small develops only smallest the seven larger at sea-level, But, accompand develops only uned larger at sea-lovel. super-charge fan, it develops slightly mare power at 20,000 feet. Moreover, the difference in weight is \$30 pounds, in favor of the smaller engine At this situtude the weight per horse-power is 25 pounds for the smaller engine and 43 pounds for the

It was a coincidence that within the last at was a coincidence that within the last few weeks, an item appeared in the news-papers announcing the development in Pans of a similar device, which has been designed by the eminent Franch engineer, Rateau, so well known for his work in the turbine field Detailed technical descrip-tion of this device has not been published, and such information as we have been able to acquire has been gleaned from an illustrated article, which appeared in one of the Paris newspapers

While there are fundamental difference between the American and Rateau superbetween the American and Rateau super-charge blowers, the functions of the two are the same, and the general application to the engine of both devices has been accomplished in a somewhat similar

The essential difference between the American and Rateau super-charge blowers appears to be in the method of drive The American blower is driven mechanically, whereas the Rateau blower is operated by a turbine actuated by the exhaust gases of the engine From available information, it would seem that the Rateau blower is generally similar to the American blower, consisting of a fan, operating at ap-proximately 30,000 revolutions per minute; the method of mounting and connection

to the carburctor is also very similar.

The exhaust turbine drive has received serious study on this side of the water by various study on this side of the water by various engineers, but as yot, the difficulties have not been successfully overcome. The bank pressure, which the exhaust turbine imposes on the engine, results in a serious loss of power and economy, and moreover, ioss of power and economy, and moreover, causes the engine to heat up with resulting valve and piston trouble of the most serious nature. The terrific heat is also very destructive to the turbine

The development of a successful super charge blower opens up enormous possi-bilities in the aircraft field, and it would seem that the future holds much in store for the successful application of such a device to all military and high speed ar-planes, designed to operate at high al-titudes. The theoretical possibilities of high speed at high altitudes are almost unlimited. In fact, the human element is the only factor that would seem to constrain progress in this direction. It is probable that the development of the super-charge idea will be applied to the human occupants of the plane as well as to numan occupants of the plane as well as to the engine, and imagination pictures air-planes of the future proceeding through the upper strata of the atmosphere, 30,000 to 40,000 feet above the earth, at speeds of from 300 to 500 miles per hour

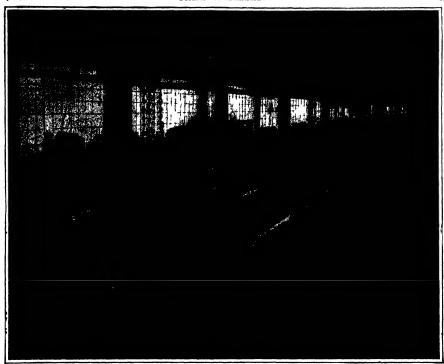
# Pulling the Trigger by Fluid Pressure

(Continued from page 518) Continues from page ats)

This gear was turned over to a naval
houtenant who made a number of improvements, the finished product being known
as the Soarl' gear. The idea once in hand,
numerous mechanical gears were brought
out, but all were handiespeed by one great
drawback which it seemed impossible to

\*\*Continues of the seemed impossible to the seemed impossible t The ungare when he was an activate the horse-power at 20,000 feet is maintained at 400.

The ungare which is seemed impossible to vercome. The things was a deleast operation, and the adjustments necessarily the horse-power remains the same, namely, the horse-power of the same and the same a



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# Pulling the Trigger by Finid Pressure (Continued from page 624)

naturalised in Eugland, and he applied to it a pinneigh in which he had just become greath; interested—namely, the trans-miss in of power through a column of fluid Because he encountered this principle while experimenting with sound waves under water he named it the "sonic" principle. He emphassizes that it is not as though the fluid were a rigid column, and emparted shock in the same way that a stedge imparts the blow of a hammer to a bar upon which it is held by a second workman There is actually generated, by an impact upon one end of the column, by an impact upon one end of the column, pressure wave-which traverses the rolumn at the rate of 1,900 feet per second, divering a blow at the other end, not instant un ously, but after the lapse of the mifinite sum interval aelied for by the velocity and the length of the traverses. doubtless their failure to appreciate that the outht did not constitute a rigid system that | pt the Germans from learning how to operate it -for its advantages are so marked that had they been able to unravel the secret they would surely have used it

onstantinesco's apparatus consists controlly as our drawing shows, of a copper pape filled with oil, at one end of which is a piston and of the other. which is a piston and at the other a push-rod to operate the trigger. The piston is connected with the propeller shaft by a gear and a cam. At the propeller shaft by a gear and a cam. At the proper matant in each rotation of the propeller, the hump on the cam drives the maton dear am drives the piston down upon the end tam drives the piston down upon the end of the oil column, which is under a pressure of 150 pounds. Through this compressed column the shock of the piston blow travels as a pressure wave, and when it reaches the other and it operates the hring mechanism the rotation of the propeller per s and with no friction except the

It is ut course not desired that the gun begin bring the moment the pilot takes th begin from the moment the pilot takes the art, and continue until the makes his land-ing and stops his engine. So some means of control must be provided, and this is made possible by the necessity of having the oil column under pressure before it will fram unt an effective blow. A small chamber is provided, connected with the copput pure, and normally the oil occupion When it is discrict to set the jum going the pilot thinks a semall liver connected. with his joy-stick, and this, with the aid of the spring shown in the reservoir, expels the oil from the reservoir, forces it out into the pape and puts it under pressure there—I ben things begin to happen in the oil column, and the gun begins to speak

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(Continued from page +14)

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The United States is the leader in the machinery market of Australia and its sales of woodworking equipment have been developed that fy in this way. A sample machine is sent to the signs or imported, and the same of the sa

### Long Distance Motor Transportation (C ntinued fr + pige =16)

or truck to easy thref-unit ading at destination from arts to trucks or freight station fourth-unit a lang from trucks to stores factories reared ousses and fifth-handling in east the goods are removed from the car to freight station and held until the consigner studies a motor truck to remuye them.

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congestion became so aute
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and more extended distance of travel, the
upkep of motor trucks has proved to be
less expensive than the maintenance of
horses One of the big trucks of the feet
under discussion has been in the service
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\$4.00 \$4.50 \$5.00 \$6.00 \$7.00 & \$8.00 Fyou have been paying \$10.00 to \$12.00 for fine ahoes, a trial will convince you that for style, comfort and service W.L. Douglas \$7.00 and \$8.00 shoes are equally as good and will give excellent satisfaction. The actual value is determined and the retail price fixed at the factory before W L.Douglas men and the retail price is a stemped on the bottom.

The stamped price is W. L. Douglas personal guarantee that the shoes are always worth the price attention and the price paid for them. The retail prices are the same everywhere. They cost no more in San Francisco than they do in New York.

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# The Value of Suggestion

In a recent interference proceeding involving five separate applicants for a patent, three of them attributed their conception of the invention to an illustrated article abpearing in the SCIENTIFIC AMERI-CAN. By placing before your engineers, designers and mechanics for systematic study, copies of patents, you may stir their inventive faculties to your great advantage.

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# SCIENTIFIC AMERICAN

626 Woolworth Reilden

New York City

Till mention of castor oil provokes a reminiscent protest as a rule associations which most of us would rather forget and yet today, it is brought home to us that this particular oil is of outstanding military value especially as a lubricant the engines of aircraft of all sorts

Lirly in the year the War Department and the Department of Agriculture joined fore s m an energetic campaign to induce the furners of certain sections of the of quite 100 000 series of easter bean plants and as a consequence of this patriotic appeal to our tillers of the soil 108 000 acres were actually sown. The urge to this iction was the need of something like 5 ion 000 gallons of castor oil for the natire highling flying machines

I stensive experiments carried on by the of Arcrait Production of the War Depart-me t proved conclusively that easter oil we the lubricant par excellence for fast-runing, motors for acrial service. Up to pent various blends of mineral and very tible ods did well enough but none of these was found capable of answering the surreme tests of sustained flight under a with range of temperature and varied all sphere conditions value someall sphere conditions vature somethu teristics that were singularly and strikingly united as if the wants of mechancal flight had been currously antica pat d

Why it may be asked are the needs of the aircraft motor any different from other high speed engines? Strictly speaking the To pure ments are not essentially dissimilar so long as the surplane travels close to the ground and there contends with much the same conditions as the prime movers of a ruing automobile. But the moment the flying machine mounts skyward the physical circumstances under which it operates ate tade ally altered the atmosphere in the course of a few minutes may change from a temperate to a very frigid temperature and not only that but the baron ture and not only that but the paroine-or, pressure is lowered directly, materially affecting the propulsive power of the gaseous explosions within the cylinders. Again in order to get a maximum of the color of the color of the cylinders.

driving energy with a minimum of weight the designer of the aircraft motor has ligd recourse to aluminum pistons functioning within cylinders of special alloy steel. Therefore in order to protect the much softer aluminium from the abrasive action of the neighboring walls of steel and yet to insure a snug chough fit to prevent the premature escape of the expanding gases, it is imperative that the two metals be continually separated by a film of oil only that but the lubricant must not be thinned out by the intense heat of the tunner out by the intense near or one combustion within the cylinders, it must retain its body hold its place, and yet possess anti-frictional properties of a high order Lakewise the oil must not carbonize of foul when exposed to the explosive I maily the lubricant must main tain its fluidity even when exposed to the effects of intense cold for otherwise it effects of intense cold for otherwise it would fail to flow from the reservoir on to the pump and thence through the various pipes to the points or moving parts to be

If the flying machine could stop or return to earth in safety whenever the engines bilked or the oling system went wrong, probably numerous other fubricants might d) well enough But the airplane, pardo well enough But the arplane, par-ticularly the multary raft, must be able to stay aloft for hours and hours, and to travel above enough territory with a reasonable chance of escaping destruction or capture because of engine breakdown. Contanous ervice for a hundred hours is demanded of the motor before mechanical overhauling of a material degree is necessary To achieve this mobility it is indispensible that the lubricant be of the very best and susceptible of standing up to its work no matter what may be the weather or the oution of the mercury in the thermometer.

The Castor Bean and Its Many Uses Nothing else meets these manifold conditions but castor oil

(astor oil, so it is said, has the highest specific gravity of any natural fatty oil and is unrivalled in its viscosity, i.e.

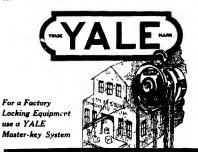
and is unrivation in the vessionity; i.e. body, by any other known natural fatty oil. Not only is it singularly unresponsive to high temperatures, but it flows freely until it freezes at a temperature between 15 and 20 degrees Fahrenheit below zero I urther the oil keeps remarkably well even after an exposure of several years to the atmosphere These are the physical reasons for the choice of easter oil as a lubricant for the engines of aircraft

Popularly, this use of the oil seems ! sudden discovery and the diverting of the material into new channels of service previous employment, as the average lay man understands it, being mainly limited to medication As a matter of fact, castor oil as a lubricant has been doing its helpful bit for a good many years in various parts of the world, and has been doing its work well at that Further, the industrial arts have drawn upon at latterly to a generous extent, but don't let us anticipate the story we have to tell Until about 1900, and previously for quite four decades, castor ans were raised in considerable quanti tics in parts of Oklahoma, Kansas, Mis-souri and Illinois and earlier still the plants were grown to some extent in Virginia North and South Carolina, Georgia Kentucky lexas and California In the days of the domestic plenty of the easter beans they were utilised in the making of oil both for lubrication and for medicine but the industry dwindled rapidly after 1900 when our farmers found they could raise other crops that paid them better and mineral lubricants said competing castor beans from India emphasized the of this course on the part of our husband-

In India the castor bean has flourished naturally for untold years and has been cultivated assiduously for a number of decades Just how many bushels of castor beans are harvested annually in India is not recorded nor are her exports of ca beans and oil an index of the measure of the ndustry simply because the people of Indiantry simply because the people of India use enormous quantities of the oil for domestic services. However, there are some suggrative figures available. When the various countries of Europe began to realize prior to the war the value of castor oil as an airplane lubricant oil as an arpiane numerous one common upon India nureased steadily During 1913 and 1914 preceding the outbreak of strife Germany doubled her prevous imports of both castor beans and castor oil from India, and between 1914 and 1915 the from India, and between 1914 and 1915 the Indian raports of the oil amounted to nearly 900,000 gallons, while during the interval between 1918 and 1917 she shipped away about 1726,000 gallons During the present year, Great Britain commandeered the entire exportable supply of Indias castor beans, in order that she and Illiud and that she and her Allies might have the fullest possible measure of the lubricant for their senal squadrons

It was this situation, with the prospect of a very large air fleet of our own, that impelled the U S Federal authorities to urge the extensive cultivation of case beans in this country To help us in this venture, Great Britain released for seed venture, Great Britain released for seed purposes a matter of substantially 6,330 long tons of Indian boans The Depart-ment of Agriculture painted rather a promising picture for the encouragement of departure. phonomany picture for the encouragement of domestic growers, and announced, in effect, that the farmers might expect to harvest anywhere from fifteen to forty bushels of beans per acre, and the Government guar-anteed first \$3 50 a bushel and then, some anteed first \$3.50 a bushed and then, some months later, rassed the price to \$4.50 a bushed. It is unfortunately a fact that the foreign seed, esseancal handreaps, and possibly the general newness of the under-taking have operated against the hoped for results, and, taking the industry here, by and large, an average yield of only five bushels to the arre has been achieved. This does not augur well for the future if





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Because Williams "Vulcan" and "Agrippa" Chain Pipe Wrenches have stood every test during years of hard, continuous service under all conditions, they have earned a well deserved reputation for dependability, and are favorably known the world over. They embody every good feature that Williams Superior quality stands for.

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For a though the constitution of war modify the regency of a great supply of castor oil, at is undersable that the commercial and sure uses of the flying machine together with the military aircraft that we shall suitely have to have will call year by year for increasing amounts of this lubri-eant. And whether or not it will be worth

while for our native growers to continue in the business will depend in the main, or developed for castor oil and the by-

products of its manufacture

tee ording to the grade or stram of the beaus they contain anywhere from 46 per out to 53 per cent of oil, and of thus 33 p r cent is commonly yielded by the first expression. This is a cold process, and the oil so obtained is that which is devoted to pharmacy and to the high-grade lubricant calle I for by the flying machine as well as the racing automobile. Subsequent ex-pression gives 7 per cent of addition oil and it is possible to increase the total viold by treating the oil cake with a suitable sol-It is the belief of some of the manu fact ir re that much of the second grade oil would answer even for surplane service

And now what are some of the uses to

which caster oil apart from that of a lubricant for air craft is put or may be turned? Ordinarily we require here yearly about 1 000 000 bushels of easter beans, and only 25 per cent of the oil extracted, if quite that much is consumed in the various departments of pharmacy. The other fields of employment are much more ext usive than most of us realize For in the monufacture of substitute or arti-ficial leather which takes the place of natural leather in the upholstering natural teather in the uphoistering castor oil is an essential component in some artificial rubbers and there are various kinds of colluloid which depend upon the product of the castor bean Castor oil furnishes a very satisfactory coloring for butter, and from easter oil is produced the so-called Turkey-red oil, whi is an important factor in the dyeing of textiles and in the treatment of the fabrics. One of its largest uses is in the making of transparent soaps Castor oil stears and in the manufacture of candles and from it is also obtained capryle and while lends itself to the composition of varnishes peculiarly suited to the polishing of all kinds of high-class furniture, carriage bodies and paintings and is extensively employed in the preparation of vellum, tracing cloth etc. Caprylic acid plays a part in the production of others which are used by perfumers and confectioners Castor oil is used in the making of certain waterproof preparations, and a liquid dis-infectant is obtained from the "seconds" or lower grade oil The oil is an admirable preservative for various kinds of leathers. is extensively used in the leather industry, and is particularly serviceable in adding service life of leather belting em ploted in heavy work. Our fly papers would not be so effective if it were not for east or oil and the oil enters into the get

cast roll and the oil enters into the get-up of a great many adhesive agents In the sugar mils of the West Indies, upon the railroads of India and other parts of the Far East, and in British shipping circle castor oil has long been used as a mechanical lubricant, affort, however, it is generally blended. In India the oil has been found to be an economical and Doen found to be an economical and Deterrist stimutation support illuminate—gying a markedly glab micro-organizms and the galvanic bulliant flame Indeed, the peoples of action of the current on their beddies in India have found ways to utilise the oil and the refuse ponace which may suggest. With the above proven facts in mind, other currence here in the future. The is it at all surprising that encrimous in-ponace contains from 6 to 7 per cent of creases in production have been reported or introgen and as measurable amount of where electricity has been properly applied potash, and it is authorizatively said that to this new art of promoting the growth of the castor-ecod calca concesses 25 in ere cent vesestation?

from the seed care after the ou has been extracted for other purposes. Notwith-standing the pretty general belief that the easter bean plant will not be touched by cattle, it is stated as a fact by competent authorities that the leaves, not the stalks are widely fed to cows in India, and an added yield of milk is attributed to this added yield of milk is attributed to make forage. In Assam, the foliage of the caste bean is cultivated largely for the purpose and an excellent of feeding silk worms, and an excelle paper pulp can be made from the plant

### The Theory of Electro Culture By Robert D. McCreery

IF we believe in the ionic theory of Electrolytic Dissociation we are con-vinced of the fact that when an electric current is driven through an electrolyte there is produced a movement of the "ioms

that carry charges of electricity
In the use of direct current the negative ions move to the positive electrode and the positively charged ions move to the negative electrod When alternating ourrent tive electrod. When alternating current is used the ot the case, the ions move rapidly first in one direction towards one electrode, then in the opposite direction towards the other They are as it were in a state of intense vibration of an oscillating nature, caused by, and in unison with, the waves of the alternating current

What then happens if we discharge high frequency electricity through an acre of soil to metallically coated seed, from electrodes (parallel to each other), em-bedded in the earth?

The earth is in this case the electrolyte, in which by the action of water, there have been gaseous ions set free When the In which by the scott free When the electricity is applied, these ions set up an active bombardment on the seeds and tiny roots of the plantlet and since the see and roots are porous it must be evident from a mechanical standpoint that some absorption, by the plant, of the gaseous ions takes place. After being absorbed by the plant roots these ions are still subject to the influence of the high frequency electricity which, during application, will set up vibrations within the cells of the Such an action will mechanically enlarge the cells in the tissues of the plant

and allow it to grow more freely

The discharge of high frequency electreity through soil is also equivalent to
seration since it causes air to be drawn into
the soil with it. This is us a great measure
the principal benefit derived from cultivation and is, therefore, an important factor in agriculture because of its stimulation of erial action

hacterial action Moreover the discharge of high frquency electricity through the air combines with the moisture in the soil to produce nitrie acid, which contains nitrogen in a form readily available as plant food. On the other hand the electronic collaions of the ions with alkalues in the earth recoluse nutries.

matons of the ions with ascause in the earth produce nitries. The earth in a sense becomes a storage of nitrogen that must be deanged by the soil bacteria before it becomes available as plant feed. Thus makes work for the soil-building bacteria. In 1009, Prof. G. E. Stone of the Massa-

In 1909, Prof G. E Stone of the Massachusetts State Agracultural Cellegs, proved in a series of teste that by discharging each day a few sparks of state electricity through soil containing bacteria, these organizams in 17 days increased 600 per cent. There is another influence of electricity on the bacteria which might be termed bacterial stimulation. Bacteria are shuggash influence organizams and the galvanic days in the contraction of the series of the series are shuggash influence organizams and the galvanic series.



# HARRISON Gellular Radiators



### How an \$18 deal on a heifer grew into a great nation-wide business

Fifty years ago there lived on Cape Cod a young man whose sole capital was \$18 and an abundance of energy.

His money he invested in a heifer his energy in dressing the heifer and selling the meat to hungry Cape Codders.

The young man was Gustavus F Swift, and out of his \$18 deal eventually grew a great nation-wide organization.

It is an organization built up gradually from its modest \$18 beginning by putting cash into the business, and by saving and reinvesting each year a part of the profits, which amounted to only a fraction of a cent per pound,

The shareholders have been content with reasonable dividends, and have been willing to allow the remainder of the profits to be used to expand the business and the service. as the country has grown.

The fractions of cents that have been saved from annual prof-tis have helped to build new packing plants as the demand for mest grew fractions of cents have financed new branch houses to supply vital needs of distribution—fractions of cents have built refrigerator cars to make fresh meat regularly avail-

It is difficult to imagine any other method of building up a vital business which would involve so little hardship to the people of the country.

If Swift & Company were to eliminate its entire earnings these fractions of cents that have built packing plants, branch houses and refrigerator cars — the price of meat would be practically unaffected.



# Swift & Company, U.S. A.

Pounded 1868

# Important Announcement

The large increase in our practice before the Patent Office since the close of the war has led to our opening an office in the city of Chicago for the convenience of clients in the middle west It is located in the Tower Building, corner of Michigan Avenue and Madison Street, and will be open for business on May 15th

The Scientific American has for many years had an office in the Peoples Gas Building This office will now be transferred to the Tower Building and will be consolidated with the new office of Munn & Co

Chicago Office Tower Building Michigan Avenue

Washington Office Scientific American Building 625 F Street

MUNN & CO Patent Attorneys Woolworth Building, 233 Broadway New York City

### NEW BOOKS, ETC.

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tails concerning the value of tabor and the of living in various industrial countries, value of a work of this scope is at one ages and it introduces conditionations that shoul part of every menalizeristical that shoul

NEW BOOKS, ETC.

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production of the control of the con





# GMC Quality Its Own Best Proof

When a product is built inherently good—good for its own sake—that fact will inevitably impress itself upon the minds of users and prospective users.

This is on the principle that truth will prevail. And this is the principle underlying the rapidly widening reputation of GMC trucks for plain, honest quality.

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That users keep on buying more GMC trucks is evidence of this fact.

Let your next truck be a GMC.

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# SCIENTIFIC AMERICAN







# KELLY-SPRINGFIELD CATERPILLAR TIRES

# When Fate and Fire Throw Dice

A TINY SPARK, a sputtering flame—then a raging furnace of heat fire and destruction, another town or perhaps a whole city desolated gutted, wiped completely off the earth victims of the red scourge.

When will it stop?

By some ward schedule yet with remarkable accuracy, fate and fin pick har path—and it is usually across the inflammable roofs of a community. And what is to halt the progress of root to-roof fires unless it is a roofing which resists fire and stoys its spread;

Such roofings are of Johns-Manville Asbestos a mineral which satisfies every roofing requirement as to durability and conomy, and in addition adds the supreme quality of fire protection

When the greatness of Johna Manvilli. contribution to a "fire-safe America is fully realized their will be a better understanding of ASBESTOS, a clearer appreciation of its uses—and most important of all there will be fewer fires.

Johns-Manville Asbestos Roefings are made in many forms so that now every building can have the protection in needs. Jr. hars-Manville Asbestos and Colorbiende Shingles for hones Johns-Manville Brocks and Plestone Ready Asbestos Roofing for at juting roofs or large permanent buildings. John Manville Built Up Roefing for all flat surfaces and Johns Manville Surf Crugated Asbestos Roofing for sektion frame buildings.

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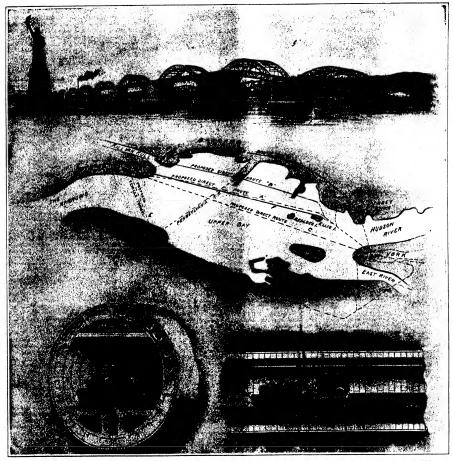
# SCIENTIFIC AMERICAN

# THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX.

NEW YORK, MAY 24, 1919

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In the map, tunnels are shown by broken lines and bridges by full lines. Above is the proposed bridge running from Ellu Jainot to Staten Island and below the proposed vehicle council to Bay Ridge, throwing flow vehicles should be transported on flat cars.

Various plans for connecting Staten Island with Manhattan. (See page 548)

# SCIENTIFIC AMERICAN

Published by Scientific American Publishing Co Founded 1848

New York, Saturday, May 24, 1919 Munn & Co 203 Breadway New York

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The object filtre j is it us to re ind accurately and luculty the litest surity; mechanist and industrial mass of the lay be wrelly journal it us in a possion to announce intrinsing deal pounts before they are published the it.

The Fixtr 11 glat t have submitted t him timely articles assutable ft there clumns especially when such articles a successful such articles a successful such ghotographs

### From War to Work

III greatest dord of kindness ever done to Germany was the stroke of the Allied pen which reduced here usus from a put intal military force of 10 000 000 to a parameter point force of 100 000

Jur thereby have the German people hera turned from war to work. Hes cannot nay lunger war but they can work—they must surd—and they will. Factorism and commen a sure point that way. Your German is nothing if he is not juristical, and whatever may be wrong with his payrit dogs, the cain way which he even to the fact that at the present innonest the division thing for him to division from the month of the month of the work of the work of the work of the whole of his work of the time in that in and apply innest five the days of determine in most in the last of a country look determine in the time to the total of a country look type in the sure of the work of the country look type in the co

Nor is the track see hopeless as behondenum and his conduit is would brive us believe

In the first place the terms unposed on Germany or far less one-rouse them a terminal trumphant would have laid upon the Albers and no one knows the so well as the Germans thereafters for despite their radius against Prendient Walson they are well aware that he influence has wen for them an ossue capitation then they would have been called inposite work out if the four toes points indicate the property of the p

Moreover Germany will go to work rid of the crushing weight of her naval and military burdens. Pre-was statistics above that in money alone this reprin seated the huge sum of \$400 000 1000 annually—which was exceeded no doubt in the loss of row use due to the deversion of many mills me of her people from industry and com-

The return of them houts of Garman workmen to the factory and the farm and to transportation on land and see all 1 persons agrees addition to the wealth of the country and the resulting revenues when added to the charge and of \$100,000,000 due to unitary retentant unit should coult present an annual addition of a billion dollars to the sects of the nation. A further increma to few with will lie due to the reconstruction of her yeard armanism works for the production of articles of trads and commer e

Germany will go to work not mettly in the maternal but also in the moral and thosel world where it was the but also in the moral and through world where it among the man in his way. But it to the conductance of the world that six his world to the moral forwar a revalid that six will be content to remain forwar a survey of the world that six will be content to remain forwar as are reason by which to return than that timed international highway which is builded of honor, consobration and mutual soud faith!

Some faw man of note there are in terminal who clearly caller, these truths in all their maked simplicity, and to their honor be it wast that in the misst of all the present rhodomontade over the no-called brutality and litter and of the present received in the vinas not heartness of ones, to the German people. Be quote and quete work

### Crop Growing on Contract

ROP production on contract as American farmers will grow wheat the coming season, the United States government guaranteeing a stated price for the entire crop, m new in agriculture a war-to emergency measure which will not likely be repeated, but crep growing on private contract was in practice before the war, has been und by extended, and will un doubtedly become of great permanent importance. It is not generally known that the entract system is followed exclusively in the best sugar industry the scope of which in the American West vastly increased during the war that factories causing sweet corn, peas, tom toes and other vegetables invaliably sign contracts with growers agreeing to take pr in thom at a stated price before the seeding season that dehydrating plants vinegar manufactories, picking concerns and lam manufacturers find the system in indepensable part of their business. The vast seed-graving industry of the United btates is operated very largely now on a contract basis I xtension of the contract the overywhere makes for stability in agriculture It his materiak and speculation and is heneficial alike to go u r and buyer. No farmers in America are more pring r ris as a class than contract growers who know before ti scann starts to whom they will sell their grop, what | 11 they will obtain, and who in consequence can devite their whole energies to improvement of cultural methods and attainment of maximum production

When a crop is grown on attract the farmer nearly always een make convenient arrangements for handling it either through loans due, if the contracting company or of a load bank in win his company is a heavy deposited contracting impunes like the best sugar manifesturers generally have held men expert in production of their special or pick give free assistance to fainter to he companies at the former in companies at the former in companies at the former in curvay way; as all stucces even finding labor for him. It is a ray, they have not dwestern best on the former in curvay way; as all stucces even finding labor for thimmag and the just mag exason work and in the full for pulling in it; pung. These workers also are on contract in that case with the farmer performing works are on contract in that case with the farmer performing works are on contract in that near with the farmer performing works are on events are the contraction.

In January this year ( I rade sugar best growers were signing contracts f r the 1919 crop at \$10 a ten in thousands of other thin r and i children growers were signing crop contracts it [ rues which practically surranteed them a profit lik year.

In the Pacific Northwest the entract plan has recently been extended to exchand our . At so much per

are, management synds it is prime spray interrop harvest park and shop the four of rehards. Some such contractors have several hundred at rec under their care A large part of A nor a whole malk as sold to sty distributions on prace contracts in smoothly or longer. In New England the enter barponning process is between the erty distributions and an association which represents thousands of producers. The France Valley Milk Producers Association of the Northwest is not large by mambership representing only about 1000 distrymen; yet it alls over a mallion dellars worth of milk a year on

contracts between it and dustributors. The contract plan substitute for a problematical market a certain one. If the farmer thinks the price offered is not low, he not 1 not give the crop a fact which in itself practically guarantees a profitable quotation. There are obvious, hints to the development of the contract crop idea but within its own sphere it is fine humans for sell instruction concursed.

### The Fighting Ships of the World

THERE was evalue of during the past four or favy years that num a naval enthusant was trying to keep not les record of the game and losses of the national that ware engaged in the Great Myr—a thankinet take is must of them sooner inker discovered Such facts or supposed facts as were discovered Such facts or supposed for supposed facts as were discovered for government censorship concealed or disclosed losses secondage as it was fit.

With the signing of the armstere however, oil the governments showed a wilcome and much-appreciated liberality in the matter of naval information with the

result that the various naval annuals that see Making their belated appearance are able to place believe tuples a remarkably complete stetement of the present standing of the naves of the world Completes these publications is Janus' Flighting flaus" for the year 1918 the appearance of which marks the twenty four year of suce of this weakly-known work. Th delay in its appearance was due to the fact that one-half of the book, comprising the British, German, Unsted States Japanese, and Frunch sections, was not released until the consorbing of naval information cause to as eed The delay was not without its advantages, since it embied the publishess to include a Supplement despite on the new terms of the delay was not without its advantages, since it embied the publishess to include a Supplement despite.

In its general makeup and the complessesses of its information, this volume is generally similar to those with which we were familiar bothers, and curring the early years of, the Great War. It compress nearly 600 gas of mormation, and with the acception of the British and United Blates navies, there are the usual half-ton-engaryangs followed by Jans exception of the British and deek plans and the armor and gun distribution of the principal shape. Twenty-one pages are devoted to a tabulation of the ships lost in the war, which is rendered particularly valuable to the historical by the insertion after each ship of the date and obvioustances attending its loss. If m a grueone list starting with the British less of 5 hattle-rusers 12 battleships, 12 armored rusers 9 protected and light crussers, 8 monators, 81 destroyers, 5 torpedo boats 25 or more submarines, and 57 merchant suturbares. Compared with this, the fiest of the United States comes of very lightly with a less of the United States comes of very lightly with a less of the United States comes of very lightly with a less of the United States comes of twenty-separate of torpedo boats 15 submarines and 9 mercentiles auxiliares. A more of the submarines and 10 mercentiles auxiliares. A forther of the submarines and 9 mercentiles auxiliares. A forther of the submarines and 10 mercentiles auxiliares a Legal on the actions; 2 hight crusser, a product of the crusser, a product of the crusser, a product of the crusser, and a submarines and a submarine with some vectors of annuller unportance and a submarine with some vectors of annuller unportance

At the time of going to press the editors of 'Fight ing Shps were in some doubt as to the extent of German losses in expital shape and the probability is that it appearance of fellicos work and access to later in formation will provide us with a more exact statement in the 1919 issue. The bettleship loss is set down intentitively as halps and it is definitely stated that the Gernana lost one battle-crusser, 6 armored crussers Is light crussers 45 or more destroyers, 14 or more torpoids boats and over 150 submarances. Admiral Sims has recently stated that the total German loss in submarance were also (set Austras is credited with the loss of 3 or 6 hattleships, 9 light crussers 2 monitors a doson destroyers and torpodo boats and 13 submarances.

The inclusion of the naval conditions of the armistice both for Cermany and Austria-Riguagary will be approciated by historians who will find the book to be a valuable work of reference particularly as it includes the

cated by Antorians who will mel that moote to be 8 vales of reference particularly as it includes the terms imposed on the lesser powers, Turkey and Bulgaria Although his Bupplement on new Bettish war construction contains no photographs or line cuts, the test is complete as far as it was available at the time of feron It is a foregidable lim', including the great crusser battle-ship "Bood", the so-called "hush" allaps, and various inch crusser, conditors, destroyers, and submarines most of which have been illustrated and described in the Ecurety-Austrian.

The public as a rule do not appreciate how greatly the strength of a navy is related to the suitabor and excellence of the harborn, naval bases, dry dods, and other shows facilities. One of the best features will explain a supplication in the excellent charter of the isoding harborn, navy yards, ste, with their facilities, which precedes the obspice devoted to each navel power. Jane's "Fighting Shipe" in seconomy with all judicactions of its class was hard hit by the war, and we are glad to see the promise in this first sense after the war that it will continue to making a self-camed regulation.

The present editor, Mr Maurice Prendergest, assures us that the 1919 editors will appear at a moth earlier date than this serse and that it will do full justice, by text and illustrations to the British, United States and

### Electricity Astr

Electric Arc-Welding Nomencienture.—In order 1 standardies the various types of electric well employed in shipbuilding work, the Welding Committee of the U S Emergency Fleet Corporation have prepared a chiert describing these by means of symbols For meanes, a strap weld us denoted by a small cavia, a but weld by an equilateral strangle, and a filled by a letter inverted Stinslasty, the design of the weld, whether angle or double wer or bowal, at poneton, the kind of wide-took weld, strength weld, etc.—and the finals of this world, are all indicated by symbols The adoption of this code has been melapomentole, and enables all the requisite instructions to be quantity are strong to the world, strength well, and enables all the viction specification to the working drawing in a veryignali space as compared with a viction specification.

American-Built Lafayette Wireless Station in Franss.—The sale of the great Lafayette varies station at Berdesuut to the Frunch government at a price of approximately \$4,000,000, and many hithert unpublished facts of American naval scientists in the war, we announced recently by Assatiant Secretary Roosevelt "The great Lafayette radio station near Bordesuu was intended to faure communication between Washington and the Army and Navy, in case the cable system was put out of commission or interfered with by German submarines," Mr. Roosevelt and 'It has eight tower and could commission to interfered with by German submarines," Mr. Roosevelt and 'It has eight tower and could commission to interfered with the German colonial state of the commission of the United States day or night It was built by the Navy I savanged with the Frunch government that we shall complete the station, which is two-threds finabed, and they will than take tower at what it counts us, about \$2,000,000 frames "

Trees as Aurials for Wireless.—It is difficult indeed to find something really new in radio communication. Things when he see hailed as new in the daily press are more often agt to prove merely developments or in-provements along well-known lines, and it is in that class that the recent tree serial tests at Washington, D C, fall & after both as 1907, experiments were certained out which trees were employed as serials. In the recent tests messages were received overflutte a characte by message of tree serials. It was also pointed out that messages were received through the agency of tree serials over short distance. However, in view of the spearchably sensitive receiving apparatis available today, the use of tree serials no more remarkable than it was back in 1907, with the relatively crude metruments of that tion.

Electric Henters in Swedem.—The use of electricity for heating purposes as comparatively zero, but ame the scorages safety purposes and the secondary to the secondary series of the secondary telephone and Norway has been more said more extensive in freedings of the damag the war, decirno heating has become more and more extensive in freedinary has been manufacturing electric heating appearates in the beginning this factory employed 40 mea, but at the end of 1917 the number was increased to 500 Extensions are now being made which are expected to be faished in the fall of 1919, when the number of employees will be about 1,200 The factory makes all hands of heating apparatus for cooking, roung, and so on, and all mind apparatus for cooking, roung, and so on, and all mind of lamps and heating materials. All of which is by way of showing how certain countries are developing their water power to the tutnost extents

A New Type of Selective Aerial.—An ordinary sarial responds best to incontage agends whose frequency clonedes with their of the norial, but it will also centilate at its own jurisd when central by selections agreed waves the same of the selections of the selection of the select

### Astronomy

Jerome Coggie, whose name is attached to the great control of 1874, recently died in France where he served as assistant at Marseilleu Observatory from 1806 to 1917. He was the discoverer of seven cometa beades the one that bears his name, also of fiv minor planets

The Adolfe Stahl Lectures in Astronomy, delivered in San Francesco in the Rasons 1916-17 and 1917-18, under the auspices of the Astronomical Rosesty of the Pacific, are to be published in book form, with the aid of funds furnated by Mr Stahl The loctures have been revised and brought up to date so as to constitute a valuable digest of information on various astronomical topics down to the close of 1918

Metacottes in Tarcitary Strata—It is suggested by Metare that the notable absence of rac opmassible meteorias from the series of stratified rocks is possibly due to the rapid disnutegration of the meteors unbatants, which even in museum collections shows a deplorable tendency to decay. It is stated however that the Britash Museum has reacetly received a slice of metrors on with the aformed at a place near Dawnou, in the Klondsto, and which, like another meteorie iron previously found in the same sudgheborhood was juring deep in carcian gravals believed to be of Phiceons ago or older Canadoan prologists believes that both objects formed part of a single meteor shower which took place in Tertitary times.

Beta Cygial Probably Tripia — I he beautiful doubs tear Beta Cygia (Albiro) a well known to the users of talescopes. The fatner component is if seconds from the primary, and that relative pastimen of the two objects have not basped appreciably during this century or more have not been proportion. Became the proportion of the primary components observations. Became pastiments of the beighter star made at Lief (Descriptor) have confirmed the auspition previously entertained that its radial velocity varies. As the star has a composite apactrum, corresponding in general to that of yellow dars such as Archurus or Alpha (asstopsia, but also abovering the strong hydrogs in loss and the weak and narrow K calcium has characteristic of many blus star, such as firms, the variation in its radial velocity is most plausibly explained by regarding it as a spectracoppo binary. In other words, Beta (yran is probably a triple star. As the colors of the two stars sees in the telescope are yellow and blag, flasty contracted, it is interesting to learn that the spectroscope pair also conmists of yellow star and a blus star.

A Complaint from the Seuthern Hemisphera-Mr C H Trup, of Thana, N E, writes to the British Agronomoual Association to complain of the common parties of agencia the nonlinear homophers in certain statements commonly found in books on astronomy. For example, we constantly find runs of the sun, mose, plands and contributions, labeled as seen with an inverting telescops! It would be proper to add the words in the northern hemisphere, since on the southern all these objects are seen upside down to the southern all these objects are seen upside down with the proper to add the words in the northern hemisphere, since on the southern all these objects are seen upside down with the proper with the northern view of them, and the mivring telescopy restores them to the positions in which they are seen with the nated gvis is northern justice. Another common error, says Mr Tropp, as describe the sun as always seeming to move in the dissociation of the hands of a watch. In the sorthern hemisphere the sun a spperant movement is just the opposite He state that were experienced instrument-unless become confound on such subjects and end to southern astronomers equitional mountaings for telescopes with the right assessand rous a firm in the northern hemisphere, and might easily lead to expeasiry mistakes if the turbines were to be used down of the same are and an and to be used south of the same and the same firm in the northern hemisphere, and might easily lead to expeasiry mistakes if the turbines were

### Automobile

Closed Bodies Popular - I here has been a marked tendency in the past few years toward the varieus enclosed types of motor cars for all the year round use. especially favored models being the coupe and siden with easily removable windows for the extreme hot weather when every breath of air is acceptable. The permanent top types have a big advantage as the overing serves to protect the motorists from the heat I the sun as well as the inclement weather it was originally designed to shield against The top when all windows ar down netually creates a better flow of air than is present in the open cars because the air currents are confined and directed against the passengers material of being dissi nated, as in the open car models. The folding top or landaulet types of enclosed bodies are also very pop because one can socure the maximum degree of tion offered by the enclosure and in a very brief period, by dropping the windows and folding the top one can due all of the advantages of the open car forms

Special Tools for Auto Repair Men -1he production of enormous quantities of popular priced automi biles has created a new industry and that is the production of special tools jigs and fixtures for making repair work easier on these cars In the early days, the rerman was forred to make his own special fixtures and it was not often a profitable thing to do because it was seldom that enough cars of one make would be received for repairs to warrant the expenditure of money and labor Now conditions are changed and so many cars of certain popular makes are used in cvin small communities that the service station is justified in stocking certain fixtures I ven the smallest shop includes valve ead and seat reamers valve granding tools bushing extractors gear pulkes and other devices of that kind Shope of greater pirtumons can now obtain engine sappering stands special cylinder boring tools, re-babbitting igo piston chinks minering rods aligning fixtures and numerous others that reduce labor and repair costs and yet that can be procured at much lower cost than they could make the devices in their own shops because they are the product of specializing manufa turers The desirability of having work done in any shop where time saving fixtures are used is apparent as the intelligent motorist realizes that he is not paying for wasted time when special tools are employed on his It may take a certain class of repairman several hours to drive off a gear from a shaft often with serious consequences to both members. The real med uses a special gear pulkr that accomplishes the work in one quarter the time and without danger

Leading Maker Adopts Dual Valves -- For some ame past considerable attention has been paid to rents of engine design that would increase power without calling for augmented piaton displacement method of doing this that has been used for a number of years in racing automobile and aircraft engines has been the use of dual valves t s, two exhaust and two intake valves per cylinder instead of the conventional half that number. In order to give superior high gear perfe mance or greater flexibility some makers of four cylinder stock cars have used this feature in their regular product It has remained for a large company that is an exclusive builder of sixes to adopt this feature on stock models, to meet the public demand for better performance on the direct drave To satisfy this in their 48 horse-power model, the company built various types of mx eight- and 2-cylinder engines and because of these experiments tuey are now convinced that a six-tylinder engine is the I great type for passenger vehicles It was discovered test the greater power output of the newly designed engines, especially at the higher speeds, was due almost entirely to the size of the valves employed in proportion to the cylinder displacement volume — In order to obtain as great valve capacity in the ax-cylinder 412 by 514 ini h engine with which its 48 horse-power model has been quipped as found in the high speed forms they develd it would have been necessary to use 3-inch valves with a \$4-moh left With a greater left, of course a smaller diameter valve would have sufficed, but it was figured that 3y-inch was the maximum lift which would ermit of reas onably quiet valve operation, so the logical solution was to use a larger number of small valves Under the old system of nomenclature the seine would have been referred to as a 24-valve design

# Cleaning Up After the Submarine War

# Bringing the Ships of Our Merchant Marine Back to Peace-Time Condition

Pill results of the way of terman U beats upon marchant shipping are to be an essured set merely by the shipping are to be an essured set merely by the shipping that be a mean of the set of sinker adapt that be upon the oran bed to in a very large (tonings whi is though topid and more or less hadly wristed was able to get near enough to a friendly coast to be backed in such as the same of the set of the

and uninstantial imposes since I of the fee home were any well found shipping varied that is devoted to general day shock and repair work, in the well realize what a large amount of time and money by we been expended and are still in a large measure necessary to bring the merchant shipping of the world back to peace-time conditions. You will find such yards beavily congested with shipping chelly of the conditions which yards beavily congested with shipping work of the conting and pounding up to the more remoistank of making structural changes involving the cutting waves of trapporty steel work and the removing of structures give the which was it stabled as part of the suit means defense equipment.

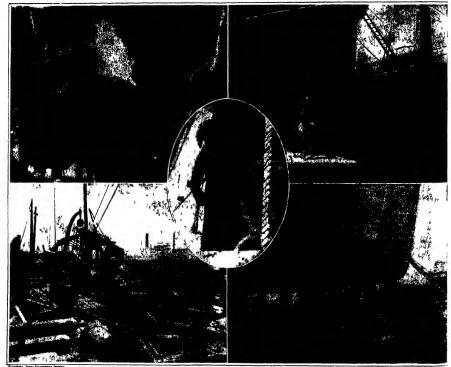
lowards the close of the war probably every merchant ship was almed for defense. The armament consisted in most case of a single gain mounted antern but in the large possengis ships included a whole battery of divergence in the gains. The ships of our own merchant marine were equipped generally with a least two gains one mounted on the forecast is dek and the other aft on the quater disk for poop. Now morder to get good command fleight above water for the gains these were usually carried upon special stict platforms built of angles channels and plating which in order to take the law yereoid of the gains had to it built of great strength and stiffness. Who this wire last one cut away and longer above and the decks and superfuretures re-

hosted asbore and the decks and superstructures restored to thur peace-time continuous.

A large proportion of the ships also were provided with the elebrated paravanes which were recently described in the Schenzerie Versites. These accessing that the third pand of special books - ratingers to say nothing of the heavy paravanes (it) - levs and the habings and gar that went with them. We of the start latter than our those and taken ashor.

What a large amount of this material was called for is cyclicit on a visit to any I surship varies where the overhading of increbant shipping is taking place Along the full length of the docks at which the ships are tied up will be seen themsends of tons of this discarded material. But the work of getting the vessels back to peace so dittent does not stop with the mere removal of the peace 
Then there as the matter of painting. The least the ven the most hundle carpe boat should get is a cost paint more every six months with a thorough panning the should more boat the matter at the should present the should be should more from the should be should more than that. It make and neglected condition of the average carpe boat the story and in many cases it is necessary give the bull a thorough eleming down to the steel before analysis a new motivation, and former.

applying a new protective coat of paint
Gradually the picturesque or hideous according t
the point of view camoufage of the war is disappearia
and shipping is coming back to the familiar black an
white and farve of pre war times



Upper left Accident burnous at work under stem of ship on the stem tube. Upper right Gang at work on propeller. Center Outsing a new port through ship a plating.

Lower left Repairing the deck where the big guas have stood. Lower right A gang at work under the fore foot.

Our dockpands are busing at work restoring smerchant ships to their normal condition.

### Linnenal Bridge Construction

Unusual Bridge Construction

A COMBINATION bridge and market
A place has been constructed by the
diplace has been dependent of the propose
and the that purile purpose so one of the
market has been and the continent to
protect the produce and makes marketing
semifortable for the outseas. It may be
that the people felt that they were sourcely
grating the value of their money in putting
up a simple bridge that was only necessary
part of the year, as the river as dry except
in the ramy season when it becomes a
magnetizem that as very difficult to cross
da the market place on top of the bridge is
used all the year and means an income to
the only in rentals, the wasdom of the
numeral bridge construction is seen at a ual bridge construction is seen at a

avy buttressed walls support the helden These are of solid control. but the walls, roof, and partitions for the booths are made of metal lath with a costing of sement. Thus greatly riduous the cost and is permanent and reprouf. A doubli-row of windows on each add. of the enrow of windows on each said of the en-closed part of the bridge gives sufficient light and ventilation so that it is always seed and pleasant on the hottost day Monatery is evidently one of the enterpris-ing Maxican other which is keeping up-to-

### Getting Behind the Seen

WE are gradually find many things that are not as they have been made to seem and in nearly every instance it has meant the addition of some now item of manufacture to America's catalog Sometime ago we learned that much of the radium separated from its ores in Germany and Austria gramated upon our continent

and was taken abroad for the refining process whereby greater sourcey could be maintained. Our Bureau of Misses remedied the situation after much painstaking

reserva

More recently we have learned that I cland spar, a

massed from which prisms are out for polarising apparatus
is from North America and that the most instal varieties m rem North America and that the most instill varieties are not to be found only in Iteland and southern America as had been advertised. The rough spar was incredy out and finished in Germany and then sold to us at an ever higher price. er price

r prices

re years of hard work American microscope makers

finally convinced Americans (von those trained in
an universities

Now we are to have American-inade pulariscopes

Now we are to have American-inade pulariscopes ave fo ners Now we are to make American-make putarisopts and polarizing appearatus referencement as set theorem and the like nearly all of which have herefore liken imported either betsues of prejudice against the home made article or because the limited detaud did not interest American instrument makers in the face of

opean competition ught we not be as independent as possible in all these are upon which industrial progress so largely depends?

### How Gun Parts are Heat Treated

All parts of a steel gui, large or small and especially the figure to be put through a very important and delated process known as he's trainent. This means the heating up to a certain fairly high it supersizes of the varyous parts and their coding them in agamentous ways. We shall not supersize the process of the control ways the first in which they are couled are smalledly replained, according to certain known laws, the steel assumes its most finely divided and crystallize shape or grain.

the steel assumes its most finely divided and crystellias shape or gram.

The illustration shows one device for carrying out this important program in the case of moderately large gun tube. The large stall chimney-like appearatus to the right is one of the heating furnace: It has a long and door—in fact almost the entire and opens out: It as partly open now in the view, and out of it have just been brought three gun tubes or packets, suspended from the accruent. They are being three forms and are at almost a winte heat. They are about it cannot be seen at the lower left hand sorner from the continues of uncertainty of uncharged and the force of the continues of uncharged are much and a lower temperature which tempera, draws, or enfects them tagistly. The silustration is from one of the resent new American occleance belong the



The market bridge at Monterey, Mexico, during a dry stage of the "river"



Interior of the bridge, showing market place and booths

### The Current Supplement

Till oran of our own what system is a subject of personnal interest to the thoughtful man and many readers will therefore welcome a paper discussing the course of the Evidence related subject to the Evidence or the Course. closely related subject wither Evolution in the current start of the Bulkarytin Vanania Vit I started No. 2304 for May 24th, 1911 where the growth of stars is discussed at some length. The possible modifications in other heavestly bodies such has in bildier connects and menghinering stars when apply soled of or even model by a given rate are also discussed. An indicated of a principle to our rotto the apply of the viter from the vi-primitive Hallam and the control of the viprimitive Hallam and the condition of the viprimitive Hallam and the condition is the viprimitive Hallam and the condition is the viprimitive Hallam and the viprimitive Hallam and the condition is the viprimitive Hallam and viprimitive Hallam and the viprimitive Hallam a



ving gan tubes from the specially-built furnaces in which they receive heat treatment

our contemporaries and living in Artenna In a long article on The Significance of me we are introduced to the modern methods of employing dre un as indices of lidden desires and showe how very little ridge desires no snowe new very neu-rason there is to regard drams as pro-plicts. The dilustrations on Sorry O : Cattl. serve t emphasis once more the constant efforts of our own Department of Agic illust for if guard the people s health and t premote the development of good breeds of farm cuttle. Closely related in unt rest is the discussion of Sea I rons and the I sherica Ind shus which endeavors in a merica and about which endeavors to entice who positional mediates concern-ing the sur hours true relation to the econ-omy of our marine fillular. The Present Saluts of Nations is stated in a particular interest since the war has demonstrated that a country can make itself independent of natural intrate disposits. Nucleic Acid and Ils Analytical Framination is briefly discussed in the light of the experience of I nglish commercial chemists working under the stress of war conditions. A much longer and well illustrated article duturner in some detail The Metallurgy of opper as handled by the electric furnace The resulting mero-structure of the ingot and of the annealed copper is also dis-cussed and the article closes with a few paragraphs on the scaling of the bars or sheets. The return of pre-war conditions on the high seas again draws the mariner a attention to his great rin my fog and the paper on Seantific Signalling and Safety at S t with its description of the device called a collision productor will be of immediate interest

### **Efficient Barn Arrangements**

MICH has been written concerning milking machines litter carriers and

IV milling machines litter carrier and thousands of American dury farms effecting labor committee but the later away possibilities of ears-fully worked out darry butking plans less talked about are at least equal axis in channing greatest effuriary. A farmer of Austorna tounty Ortano whose principal dury product is cream and who keep page to uther, the skim has harn pagery butkroom, reagne room grammy and chopping mill all so arranged that wasted in tim can learly be said to cust. He is a practical frame, and has methods in methy to imulated in other duryman. The fact that we many sets of farm buildings represent landscared development after the buildings represent hapharar! development after the

buildings represent haphward development after the first larm so outgrown explaines parth why numerous hurrs and formers an insunaging bards in premass won-lib wasterial of steps strength and time. The juggers in this Ordan's ferm corners on the barn, filling on the corner between the two buildings in the combined chagins and sold, morn and a shed. Directly at its the engine nor in with holping such at the rounning of the larm in the same of the same fixed but in the second story of the larm sell agrants, and is tweetway. A few for the internal control of the same fixed has the the juggers and that the same fixed must fixed be the the juggers and that the same fixed in the affective in the juggers and that the country and a few few laws. the cow larn the chopping mill can be reached so legiddy that a ordinarily as operated while other barn

i mudich the et outdownity on operater wante order natu-tations at its progress. In a combined engine and milk room contains a separater operated in passer. The by product, skins milk on despatched to the pagger via se pipe line running from a point inset the apartito beneath the finer to the pag putes whete it empties in the swill beareds. This divect refacilitated by the fort that the pag possers on a lower level than the con burn

The she I at the corner is used in manure removal extents the wall opening, through which manure con-vexed mechantally empires is permanently stationed a sided or wagon. When a loud accumulates the lores are hitched in and the material conveyed to the ficids

Other meenings farmers have perfected equally good learn airangements the labor saving worth of which can hardly be overestimated. The typical dirty, ill smelling farm barn is an inconvenient barn, badly lighted badly farm barn is an inconvenient name, nearly inglited badly weighted, hard to keep than constantly becoming distortined. He will planned barn encourages good care, because it is easy. It is usually not disfutit to permande the owner of such a barn to comp it properly with carriers modern stanctions, gasoline or other power, and the like

# Reconstruction in the United States

# The Work of the Reconstruction Research Division of the Council of National Defense

By Our Washington Correspondent

I is a strange anamol that the government with the keat officially form unisted plans for reconstruction should have better information and more of it regarding the subject than any of the governments of the war redden countries of lutings. Yet the work done by the Reconstruction Recarch Division of the Council of Ashound Defense has placed at the disposal to the of the government and the husaness francistal and many facturing cities of the country a more complete complished of reconstruction information than can be found any where its, in the world

initiation of reconstruction information than one be found may where its in the world.

The same of the Reconstruction Research Division are two to gather and make available the information acceded to yield perspective for the exercise of retional judgment of the souther a practice in the contraction and also to furnish has kere und for the passing of judgment of the contract upon reconstruction and also to furnish has kere und for the passing of judgment upon reconstruction process and to been intended and accessible the vital information upon the play made has not other reconstruction of this nation which has been oberitanted by the various was bosonic with his period of heart programment less up to date and perfect the possibilities of the contraction of the process of the

needs of pour and especially to meet the requirements of any industrial and social emergency incident to reconstruction which might arms and call for governmental in-

The word reconstruction is frequently used to include all readjustments all resettlements an new work in rearrangement the world or any part of it. For clarity, it is better if a sharp distinction be made between problems for readjustment and resettlement which include nothing more difficult or new than a going back to peace conditions from a war footing, sholishing those regulations and practices which war made necessary and generally getting back to normal and those other problome which are truly reconstructive w ions when are truly reconstructive which come into being because many have discovered that it is neither possible nor desirable to return completely to a status gue and, and that now ideas new practices, new laws regulations and proceedings have new news regulations and protestings have grown up during the volenic eruption we call war, which must be retained even if modified, if we are to make progress forward and not backward

Almost mvariably readjustment or re Almost invariable readjustment or re-settlement problems come before those of reconstruction proper. Thus, before it as possible to rouganise an industry, it is necessary to get back the men who run it Henre ulmobiliration is a resettlement problem rather than one of reconstruction to the problem of the problem of the problem. But if it is planned for instance to con-tinue to utilise the labor of women where

time to usuate the latter of women where control only men were supplyed then the problems of making places for both men and women, of creating new standards of both work and wages with their consequent effect upon production prices are problems of reconstruction

It was obvious to the Council of National Defense It was obvious to in tourist in vaccinat between that no resettlement resignaturant or reconstruction could be properly undertaken or best carried out if there was not available all the knowledge information and practice which could be gathered together. No man works as well in any labors as he who knows all there is to know of what the culer fellow has done, what other himself and the country which the country which the reserves are planning to works as wait in any isnor as ne who shows at these to know of what the other fillow has done, what other workins are dong what the research of the should be an extended to the should be a should be done and the should be a should be done and the governmental machinery has show one-half of the governmental machinery for the showledge or competence of the control of the showledge o

available as knowledge as to 'who knows the most about it the Reconstruction Research Division is serving the mired public and is able to effect the mandestrees, hankers, business men—to say one really interested in any resettlement readjustment or reconstruction problems a waith of material obtainable nowhere cles in the

world
Not to estaing all its resources but to indicate something
of that range, a 6 w of the possibilities of the information
review as the reason summarized. The Divisions is dearing all
rederal bothes having contact with denoblisations or
reconstruction, and possesses first-hand, up-to-dete
information as to the accomplishments and plans of each
such body or burean. If havolagh its field service 'iscluding 184,000 state, countly and community organisterior (moluting 18,000 women's units) the Division
making the contract with all state and local reconcentures. tion activities

The Division has every important report of fores ton Livinon and every important riport of trenga reconstruction activity proposed or accomplained, that reaches this country It has the best information there is on foreign commercial, industrial and financial conditions and prospects

The Division is in touch with all the war administration boards bureaus, and investigation commissions, as

THE prime purpose of the Reconstruction Research District of the Council of National Defense us to tap all markable sources of information in this country and abroad to the and, first, or interest of the working definition of reconstruction and readjustment, and the printing of a working definition of reconstruction and readjustment, and the printing of a working definition of reconstruction and readjustment, and the printing definition of the through the state of the part of the source of the total part of the total part of the source of the total part of the total p

well as with all bederal Departments. It has much uspublished statistical information ranging all the way
to describe price data and production estimates,
the data labor supply reports and the reported
results of experiments in methods of handing labor
problems—to notes of foreign production the foreign
labor and emigration situation, foreign market conditions,
and finance. The Division knows which industries are
making reconstruction readiguisticates the more promisnight, and thus can form much more reliable impressions
as to what the future may be expected to henge, than is
possible to the more restricted judgment of the average
business group.

possible to the more restricted judgment of the average business group. The Division maintains its own cipping bursest, supplemented by the services of the chief commercial cipping burseau. It esties practically everything mynth bearing on any phase of reconstruction. This material is classified, indensed and ready for reference From these situages the Division assues a dayly dignet of reconstruction news intended for the Counsil and government burseaus but available to all whose reconstruction problems are such as to estible them to the service. There has been so much vagameness about the subject of reconstruction that it is refreshing to find a government activity concentrationing inself with its details in a thoroughly practical worknown and the countries of 
and a great deal of practice in the work of the Reconstruction Research Division. It is compliations and published as not expressions of opinion of some theories but means of disseminating those facts on which, and only on which, as comprehensive reconstruction plan may be

next means of dissecurinating those races on whene, and only on which, a comprehensive reconstruction plan may be bound.

One of its most elaborate pieces of work is a nevert of reconstruction activities of the world at large in which, plans and a second property. The programs we which, plans and a second property, the programs we which, plans and a second property of the plans and a second property of the second plans and plans and plans and a second property of the second plans and plans are second plans and plans are second plans. The property of the second plans are second plans and publication of all orders of all war boards, such as the Shupping Board, War Trade Board, see the present process property of the present process programs are onlined to the present plans and plans are propertied by the property of the present process and the second plans are propertied by the process of the second plans are propertied by the process of the second plans are propertied by the process of the second plans are propertied by the process of the second plans are propertied by the process of the second plans are propertied by the plans and all of some of these are more variables for meaning the plans and all of some of these are more variables and all of some of these are more variables for meaning the plans and all of some of these are more variables for meaning the plans and all of some of these are more variables for meaning the plans and all of some of these are more variables and all of some of these are more variables and all of some of these are more variables and all of some of these are more variables and all of some of these are more variables and all of some of these are more variables and all of some of these are more variables. The process of all forugations and all of the plans and all of the second plans and all of some of the second plans and all of the second plans are proportion of the second plans and all of the second plans and all of the second plans are proportion of the second plans and all of the

sought by representatives of all foreign mand here by those who want a catholic mand bere by those who want a catholic mand here by those who want a catholic mand the mand

### The Case for Water Power

### The Present Status of "White Coal" in the Eastern United States

I N the United States today there is approximately four of five times as much steam as water horn-power in use. The aggregate water hors-power, developed and endeveloped, as around 80 millions in 1916 perhaps a triffs more than one-tent bot this was developed. means that there is still undeveloped water power in the sountry equal to twice our present steam capacity Of the undeveloped water power, about three-fourths a found in 13 western states, leaving one-quarter of the total, or some 13 million horse-power, for the East

In the nation at large some 3214 million horse-power is created each year from coal—a fuel that will ultimately be exhausted Of this total by far the greater part is in the eastern states. The tremendous water-power potentialities of the Rockies are more romantic than the properties small developments into which exploitation of seators water power would of necessity fall, but in view of the figures just cited, the latter alternative is not without its attractions. Before the interest of intors can be enlisted in any project to utilise the water vestors can be enlisted in any project to utilise the water power of the East, however, certain economic and legis-lative factors which in recent years have taught the capitalist some expensive lessons must be reviewed

In the first place, drought in summer and me in winter have withheld from the water wheel a constant source of The initial cost of building dams to overcome this was so great that companies which might in the long run have succeeded were unable during their infancy to compete with the steam engine. In addition the high cost of transmission systems in mountainous regions has

been prohibitive to some degree

The total cost, in 1914, of installing hyrdoclectric
plants appears to have been about \$158 per horse-power This includes everything, from dam to distribution If coal continues to soar, in time the comparison system. If coal continues to soar, in time the comparison will be favorable to water power. At present it can only be said that increased efficiency in the operation of the hydroelectric plant might look forward to overcoming the difference. The best steam practice secures at the generator only 40 per cent of the energy showed in the coal, while the efficiency of the water wheel frequently second 90 per cent. But at the same time, the rapid

development of the steam turbine with its increased efficiency is working on the other side of the scale impor-tance in retarding water-power development. The high value of the land required in industrial districts has been a handicap In many cases railroads that follow the streams would have to be relocated in order to make arcains would have to be relocated in order to make possible a water-power development on an adequate scale. There is the great live dam in Tennessee in connection with which over a million dollars was spent in transforming railroad tracks to higher ground. Then in transvering rearrows transk to nigner ground. Then there as some rively of really first class head sites and when such a one as found, forestry laws are likely to lack adequate, provision for land leasing A legislative obstacle lies in the fact that many streams are of an interstate character, and while the experience of New York and New Jersey with the Palisade Park and the Fork and New Jersey with the l'aissade l'ark and the Hudson Tunnels proves that it is sometime possible to get the same ball through licth Houses of two States it is never a simple matter. Morrover long term franchies held by municipal heating and lighting companies frequently place new competition at a discount And there is at least one engineering obstacle in

paucity of data on the geologic features of stream beds.
The report of the Pennsylvania Water Commission for 1916 gave the harrowing details on hydroelectric projects that have been started and stopped for various Some were begun at a time when capital was notably scarce Many companies proceeded more or less by rule of thumb, without realizing the necessity for a complete survey, as a consequence poor sites were chosen that had subsequently to be abandomed. Hydrochosen that had subsequently to be abandoned. Hydrographic conditions were often overestimated, so that when it came right down to doing business the water counted on was not there. On the other hand comcounted on was not tacre. On the other hand com-mercial surveys were frequently on an even more sketchy basis so that the markets were not nearly so wide as had been autospated. In three instances uncertainty had been suitespated. In three instances uncertainty as to the lagal rights possessed by the companies blocked further progress. And of course all these known failures have introduced a big in rai hazard. In spite of all the difficulties and all the discredit

brought upon water power in general by the failure of half-baked projects and recklessly promoted schemes there has been genuise progress by wat a power through out the Last Indeed all the obstacles recited abo that can be overesme by intelligent attack They have been so overcome and on a seale sufficient to demonstrate the advantages to be reased in overcoming them

First of these is conservation of titel Second is the progress toward ultimate electrification of our railroads Most of these follow rivers for the best part of their length and have therefore this natural source of power right at hand. Then too water power makes electric lighting available wherever it is needed, which is not the case when we are confined to current produced by burning Nor is it true that introduction of water power means the chimination of coal power on the contrary where steam is already used it can be admirably supplemented with water power

plemented with water power

Advantages which accrue less directly from the
climination of fuel burning are also numerous. The
storage reservoirs in use with hydrodectric plants provide protection against floods during the wet season while in the dry period water from the impounding dama greatly improves the sanitary conditions along the stream below. In a ldition lains frequently facilitate

That the advantages of water generated power can indeed be made to outweigh the objections thereto when the final reel ming is struck is amply indicated by the showing of (ainda. The Yukon develops 97.4 per cent of its primary central coergy from water Ontario develops 957 per cent in this way in com petition with convenient and reasonably cheap coal supplies. Maint da shows a figure of 95.2 per cent Quebec 94.9. British Columbia 89.8, Alberta develops 43.2 per cent from water although an abundant supply of coal is available. In the other provinces the showing is not so good but even in Prince I dward Island 13.9 per cent of the power comes from the very limited water courses Saskatchewan is the one province where the (Cintinued on page 8)

## Correspondence

The editors are not responsible for statements made in the correspondence column Anonymous commu sicutions cannot be considered but the names of cor respondents will be withheld when so desired

### "Swamp Lands" in Florida

To the Editor of the Scientific American In your name of November 9th last there is an analysis along the Secretary Lane, in the course of which a tabulation is offered of the amount of swamp land in the our moue of November 9th last there is an article several states. According to this table, there are 19,800,-000 acres of such land in Florids

When a gentleman of Mr Lane s standing makes, in a When a gentleman of Mr. Lane s standing maken, in a paper of your standing, such a bald muretastament, protest is called for There is not, nor has there ever been, half that area of swamp or overflowed land in this state It is true that in 1855 the United States coded that area to the State of Florida or 'swamp and over-flowed lands,' and this is presumably where the Secretary cound the figure, but the tract cache simply did not count, as swamp or overflowed land

The site of thus town, nearly 300 feet above sea-level, with nothing that resembles swamp or overflowed land within fifteen miles, was among the lands so ceded Nearly if not quite a million acres of good land west of the

Nearly if not quite a million acres of good land west of the Appealachous River, land that is and hes always been high and dry, was included in the oceano.

The settual area of swamp and overflowed land in the State a not anoth, if any, more than one-fourth that given a fift Land's article. That in the Everghode is now being dramed, and the land is as rich as the Nide delta on these lands it is hoped to settle some at least of the returned soldiers under Scoresary Land's plan, and the Periodia legislature as its special session early in December authorisms the officials in charge of those lands to consider the state of the state of the returned lovers-meet to these and. But it is 18,00,000 sense it.

De Fundal Spiphings, Fla.

R. W. Fronze

To the Rélies of the Scinerura Americant In regic to your inquiry, you are informed that, up to June 20th, 1913, ewamp land patents were issued to the

tate of Florida for 20,201,660 52 acres under the grant made by the Act of September 28 1859 (9 Stat 519)
Of these lands, 11,630,271 51 acres were selected before March 3d 1857, and arrespective of their character as swamp or dry were confirmed to the State by the Act of

ongress approved on that date (11 Stat 251)
The total area of the State of I lorda is 47,546 240 cres, composed of \$5,111,040 acres of land and 2 435,200 norm of water

The records of this office give reason to believe that some of the lands elammed and patented as swamp, were not of that character, but no investigation has ascertained their exact area

> ( LAY | ALLMAN Communioner of the (eneral Land Office

[It seems almost unnecessary for us to comment upon the reckless manner in which, simply because it has no better figures, the Department of the Intersor hi as promulaate statistics known by st to be succered. The supposition that, even in such a watery state as Florida, over 58 per cent of the total land area could properly be classed as scamp overflowed, is all ogether an extravagant one held this correction for some weeks in an endeavor to secur held the correction for some specks in an indicator to server a reliable estimate as to the real area of resump and over-flowed land in the State, but nobody seems able to tell us, and the Commissioners a doubless right when the says that this favor has nowe been determined. This fact hard affords justification for eucletting for the true fagree or which is an undetermined number of millions of afree ou of the way — This Extract ].

### Making the Airplane "Safe?"

To the Editor of the SCHRYTFIC AMERICAN It is avident that Mr Gaetan Ajello, whose letter "How Best to Make the Afriplane 'and' appeara my your issue of Mareb 8th, 1919, has had very little practical experience of Symp As his article might discourage research in a field which will in future be of the greatest value to seronauties, I should like to point out some of

his most apparent errors
With regard to his classification of airplane accidents it is quite true that more societies have occurred at low altitude than at high ones. The vast majority of these however, have happened at training regardens or schools and have invariably been the result of inexperience on the part of the pilot. The maintenance of correct horizontal balance in landing is juriely a matter of matinct which comes as the result of experience. As a forced landing is in most cases caused by loss of

motive power it is impossible for an avictor the compolled to fly kw around the limited are in who but has picked for his landing

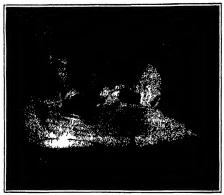
With regard to recidents at a high altitude his obser vations are entirely wreng. Accidents of this nature have three causes only breakage of some vital part of have three cluses only increased in some vivil person the fusclage or wings jambing of the outrols or a col-binum. In other of the two former cases the pilot would have time to extricate himself before the machine gained too great a velocity

The greatest value of a parachute is in the case of fire -the nightmare of every system. In the case of tractor machines it is impossible to use extinguishers as the rush of air carries the stream tway from the fire the seat of which (the carbureters usually) it is impossible to get at in most inachines. Side slipping does not blow out a fire except in very rare instances | the reason for side slipping is that it carries the flames away from pilot and that it is the most rapid method of losing Usually however if the machine is above 2 000 feet the tanks blow up before the ground can

The type of parachute that must be developed is the one which pulls the pilot out of his seat when operated, not the type in which he has to jump over the side to

open it The device your correspondent suggests to replace the parachute is rather obscure but I take it that it is type of collapsible lighting surface attached to the machine and dependent on its speed through the air for its lift. Now if this is the case it would be quite useless to prevent crashes due to loss of flying speed at low alti-tudes. For it follows that if the machine has lost speed enough to prevent its lifting surfaces generating lift there will not be sufficient speed for any auxiliary lifting surface to generate lift Again if the machine is being flown to the ground the pilot will not know until the moment of impact that he is doing anything wrong, when it would be too late for any device to work. I therefore fail to see the advantage of this device in preference to that of the parachute. The only possible use for it would be in the case of breakages or jams in the air.

Lant. R A F





Shell-shock patient in a running water bath

# Making Over the Disabled Doughboy

Apparatus Used in Our Hospitals to Restore Our Injured Soldiers By John B. Huber, AM, MD.

Photographs taken at Letterman General Hospital Presidio Nan Francisco Copyright by Underwood and Underwood

I N base hospital work while the war was on the principal thing that was watched for in every seriously injured man apart from infection was slock or collapse. The men reached the base hospital by train wenty-four the men reached the base nospital by train twenty-lour to thirty six hours after thry had been wounded. They had the most of them here long exposed to cold. Their clothes were covered with mind from the treaches numgled with their clotted blood. But bandages blood soaked or else hardened from dried blood were had been the control of t stocking in their wounds. They had been terribly jostled in transportation. Many were listless and apath it who showing their profound physical exhaustion and their shock (oftentimes worse than actual wounds). and their shock (oftentimes weree than actual wounds) from their cumulative exposure is concussion from the modern high explosives. Fine faces were drawn and punched. Hene reves were sunkn and lustrices. Their skin was cold and suffused with a chammy sweat. Their pulse was irregular weak worbbly easily compressible and the disastolic pressure taken by the aphygomanoneter was wordfully low. Hin rom intic was to sit ep. They had slept marking. They had slept fighting. They would sittle quaring main diversing and operations. But before they were allowed to slep they were given a but bath and hot soup and a very stift hypodermic instances of the superaction of the superaction of the superaction of the superaction was applied to fracture. In the most of them 24 hours later after rest and comfort their was a vast difference. The drawn and

anxious look had disappeared from their faces. In place

anxious look had disappeared from their faces. In place of a pathy they were alert and bright their color was fine their polars of good quality.

In their paties of good quality of the property of their polars of their polars of their polars. In the case of their polars war upon every quivering human nerve. Britishers upon the last lap of their rearguard actions were tired almost to death yet when they were called upon to make our last effort after an days of lighting and marching staggered up to their work like men who had been chloroformed with dayed eves gray and drawn faces speechless deaf to the words spoken to them blind to the menace about them seeningly at the last gasp of strength I obtsore and stiff limbed were such fighters feeling like old old men

-and this was to the splendid was correspondent the astounding thing—after a few days rest these beroes were young and fresh again—upon my faith it was almost impossible to believe they were the same warriors as they stood about in the evening sunshine like men on a village green taking their ease in times of peace. Their kilts were stained but they had washed off the dirt of battle, shaved cleaned their steel hats and the tiredness had gone out of their eyes and youth had come back to them Neldom indeed even in the most awful of human stresses are we left without a few ounces of latent energy upon which recuperation may be based. We have in our bodies all of us, a latent potency, our sources of mind and body, which we are able to draw on for supreme occasions are far beyond any idea the most of us have of our capabilities of the bodies are wonder-fully blessed with margins of safety over and above the maximum required by normal arivity with factors of maximum required by normal neity of the property of the factors of reasonable varactered maximum loads, but the stresses of reasonably expected maximum loads, but also those of several times such loads

also those of several times such loads to the state of the state of the state of the state of the sounder in body than both the state of the sounder in body than when they went over there by reason of the magnitures physical training they have—many of them, and so it is that Unde Sam aided so nobly by many friendly non-governmental agencies is with their bely accomplishing wonders in restoring those mained boys if not to their old shape at any rate to health and to useful vigor. Espirally must the majority of the men now in our war believed to the state of t hospitals and in our convalescent homes depend for most of their present treatment, and for their future efficiency on physico therapeutic measures—massage and passive motion, the beneficial effects of heat and light, the X-ray and electricity of baths of the baking of

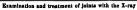


Stiff limbs massaged to restore their flexibility



Straightening the stemp of a log by means of weights and massage







Subjecting a patient to the light ray treatment

joints and the straightening of stump. In due oourse come simple exercises and gymnastics, physical instruction mechanicary, eventually skilled movements games and handiratis, graduated multiral training, and so fitness for many of the occupations in which workers are now sadly inseled throughout the lingth and breadth of our land, now a secured in peace by the courage of those same disabled men and of thir glorious combability and and of third glorious combability and and of third glorious combability.

Many of the measures just mutuoned are excellently well forthin the filters of measures produced accompanying this article. The adulting effects of the hot bath for those actually abooked have been touched on the hot bath is equally ashitary in this many cases of chronic shock now under our care. So beneficient, indeed, was list formed the medical war service that ambulance trans which brought the wounded from the field stations to the base hispitals were whenever possible, hated to the temperature of the state of the s

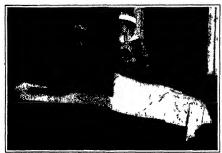
Heat in the form of auxiliarly the electro light and the baking objoints has been found most efficiencies softening up sears and other tissues, so that contractures could be manipulated and the point the most speeally is stored to its natural function. The healing expectairs of wounds was on the other with mome cases at least, shortened a fortnight by means of heliotherapy associated, of course with other measures.

Massage, begin early is most invaluable in the straighteening of stumps (in compination with aspirarities suitable to the end in visor); and in previously the permanent analysisss or immobilisation of junits by reason of adhesions, such as imast otherwise he stricthed or broken in this most painful ways if serviceable members are to be assured.

to us assured by the X-Ray has given Treatment by the X-Ray has given to deliver be introduced usually by reason of otherwise introduced usually by reason of surve fibers that have become incarcerated in any wound or operation cleatra. Such nerves are releved of compression, as the Roentgen-rays soften up the fibrous tissue Ewen deep nerve tranks feel the satistary and grasteful effects. With reput machine reactions return at the same time happily to the normal. Hers, in comewhat more detail, are the

Here, in somewhat more detail, are the plane agroved by our War Department, which defines reconstruction as complete mental and surgeal treatment carried to the point of maximum functional rostoration both mental and physical. To secure this result all methods recognised by the security of the securit

The medical treatment is not supposed to end with the physical cure Functional



Baking out stiff joints with electric heat and light

restoration is the final aim. The physical rehabilitation of deabled men is peculiarly depicted on their mental attitud. The more serious the deablity the greater the danger of mental depression and the indeposition to respond to medical and surgical featurest. There, is therefore, colucational work to be done which should begin with the soldier's arranging at the stage, where he

and the second of the second o

begins to worry about his future

This are our noble so hers taught when possible to avoil the crat he habit, and are being turned into service ble plue citizons, rather than into our lidit is to the sollars home.

### A Suitcase Motion-Picture Laboratory

THERE are times when the notion-picture man meds a small laborators equipment that he can carry about particularly when he is working in distant fields

Her tofore owing 11 the back of unitable equipment it has but in the general practice to wind the undervious I negative back to the home. Inhabition is where it could be developed in the regular way. This procedure however has a great dissolvantage namely that the cimic ramana does not know what their has him is good or not, and by the time to receive word from the home labor atory he may be too far away to shoot the some or secure were from the home labor atory he may be too far away to shoot of poor rambs the first time.

So it follows that there exists a considerable dimand for sportable aboratory. It has remained for Ridph Minoman of Los Angeles (4 — a place where almost every care is interested in motion pictures—to devise a motion picture laboratory that fits in a suitcass. Briefly, Mr. Mineman's apparatus consists of a simple print's of the continuous action design, is st of three flat pais, and a flat rack for holding the

The rigative or positive film is wound on the flat tack, which is provided with a sprintly-wound strip which serves to hold the film in place. This flat rack can be placed in the developer, here, and russer in due turn. As for the printing machine, it is simple and hand-operated a heavy flywheel providing a uniform rate of movement.



Simple printer, flat rack, and pans which form the portable laboratory equipment for the itinerant motion-picture man



# Photographing the War

Work of the Signal Corps, U. S. Army, in Recording the Pictorial History of American Military Work in France

By C. H. Claudy, Special Correspondent of the Scientific American in France

PHOTOGRAPHY has had a great part to play in the war and has been a very vital factor in almost all stary operations. The work of the agual photog unlitary operations tapher and those who develop and paint his work in data thus obtained has added a new laurel to the crown worn by Daguerre

But now that the war is over and as time heals the sears on the terrain and industry and patriotism unite to rebuild the shattered buildings photography will be longest remembered in connection with the war for its preservation of sights and scenes which must soon disappear and pass from the recollection of living men

ispusar and pass from the recollection of living men. Both French and I juglish governments have made very complete pictorial histories of their parts in the great conflict. I mixil, for both the historian and the initiary, authority the United States had in the Signal Corps an organization able to cope with the far-fluing Corps and organization able to cope with the far-fluing of photographic comparts favorably with our collection of photographic comparts favorably with control of the countries of our moune films of the war will bear varwing side by side with those of France and England, and if our midrary authorities can prove a point or build viewing side by side with those of France and England, and four military nuthorities can prove a point of build up a new science of war in the future because of the disting pictures if will be because the photographic division of Signal Corps was viry much on the job. The Inited States entered the war April 6th 1917. On July 27th of the same ever the first Signal Corps photographic absoratory was posterior in the Signal Corps photographic absoratory was posterior and in the signal Corps consisted of our officer and our private.

The I aboratory and Photographic Division as this organization is called, was formed not only to compile a organization is called, was formed not only to compile a complete pictorial history of the American participation in the war, but to assist in supplying the American periodicals with both news and propaganda pictures in this connection, it functioned through the Communities on Public Information but was in no way connected with that body except as the means of supply of the pictures which the Committee distributed

As might be expected, with the rapid growth of ship-ments of men, American participation in the war speedily demanded a much more extensive force and much larger quarters for its photographic units. So that in Febru ary 1918, with eight officers and 28 enlisted men, laboratory moved to a motion-picture plant at cennes (just beyond Paris) where more space and better equipment were available

ne work in the field was done by what were known as Photographic Units, in almost every case consisting of a commissioned officer, a sergeaut, first class, and a private, first class One such unit was attached to every division every corps and every army headquarters in France, and as many as were needed were stationed in Lugland, Italy and Russus

These units did both 'movie and still work, often

under fire, often at the front, but as well behind the lines, in the path of both advance and retreat picturing everything picturable which might be of future or was then of present interest. There has been no military

movement of any importance that has not been photographed There is no regiment which has not had its place in the pictorial files. There has been no evidence of American ingenuity in any of the sectors under American control which has not been preserved in pature form

This is the more remarkable when it is remembered that the American army officer had had no experience of Furopean war methods (Many officers of the Allies grew up with the war The American officer was pitched head-long into a full grown war. In many cases he did not appreciate what pictures might in an and not infre-quently the Photographic Unit had to fight both red taps and an old-fashioned until that pictures were of

no importance
The photographic units were a mposed of trained photographers, men who knew cuncias and camera work and often, as well, men who knew pictures from both the pictorial and the news side. The result has



Fliming a truck train unloading troops

been a really wonderful collection of pictures, how wonderful no one in America really knows both because of a lack of adequate distribution machinery for pictures at home, and because of the absence at the present moment, of any legal method by which these photographs can be made available to the American public, of which

can be made available to the American public, of which anamolous studente more in a moment. The photographic units had or asconally some atrange orders to deal with from sevir i hair officers at home, as in the case of the photographic who was solemnly assured at Washington that the engineer, having lumber, would be glad to build hims a platform to one side of a good more view of an attackfull count he might get a good more view of an attackful.

This sounds flumy, looking at it from a close view of the buttlefield. but it is nothing like as humerous as that

battlefield, but it is nothing like as humcrous as that who made written r equest for a picture of a battle

with ioriam specified objects much desired to illustrate a lecture-room point. They included a river in the forseround, with troops crossing it under fire, a battery to the left, in action, protecting said troops, and the Bocher retreating in the background.

If, however, the photographic officers and their me did not exactly get platforms exceted from which to make movies of the battle in progress, they did, more than moves of the battle in progress, they did, more than moves of the battle in progress, they did, more than to stick anything like a moving picture machine over its present the present of machine gun builded. The movie was anything the moving picture machine over the contract of the properties of the properties of the properties to these ounded, which is well in proportion to those other casualities of the fighting forces, company with the number of men from which forces, compared with the number of men from which

At the present time the Photographic Division con-sists of fifty-four officers and 418 enlisted men and cierks By no means is the work all finished, and much that could be obtained during the combat has been made available since, and positions towns, formations, defenses, etc., are still being photographed. So far the Photoetc, are still being photographed. So far the Photographic Division has developed 36,574 still negatives and 594,277 feet of original moving picture negatives. These negatives of both classes are filed and indexed in such a way that any one can be found at almost a moment a notice For instance, if some one wants to know what the second company of the sixth regiment of Marines did on such and such a date, and a picture we made at that time, it can be found, instantly Or some one wants to know what the town of Ltain looked ike on a cream date it and be found. If any portrait as wanted it is findable instantly, if it exists. In other words everything is cross-indexed and up-to-date so that there is no time lost in getting at the existing picture when it is not the contraction. when it is wanted

Somewhat the same system exists with regard to the moving picture negatives. They are in small sections, of course but so classified that on demand any variety of film can be made up Thus, an artillery authority can have one showing only artillery work, or a medical officer can have one showing only hospital work, or an 5 O S may get a movie film of any number of reels he pleases devoted entirely to transportation or any other subject, morely by specifying what he wants in addition to making and classifying these films, the

Photographic Division has turned out fourteen 1,000-foot reels under the title "A L F Weekly which are shown to rets under the title "A E. F Westly winch are above a dollars all over France, this keeping the rank and file solders all over France, this keeping the rank and file doug, and five 1,000-foot reals called the "S O B Westly for display at the various base ports—it was also used in "The Race to Berlin." Many special feature films have been made, showing also the bustories of the various staff corps in the A E. F. Of the organization of the laboratory it is unnecessary.

to speak except to say that it gets things done A personal visit to the laboratory shows a set of soldiers who apparently thoroughly enjoy their work, and who have







A group of workers in the cutting room

quarters, food and shelter close to the laboratory which are more than comfortable. The laboratory itself works under high pressure and turns out prints and films red by military authority with surprising speed, but with due regard to photographic permanent

but with dus regard to photographic permanence
Mention was made of the ourseus fact that there is no
way by which the American public can get at these
photographic records. Thus is no cone's fault, apparently, but simply a lapse or gap between the cossistion of
timer'n of the Committee on Public Information, which
body formerly distributed the war pictures each it by the
flignal Corps, and the creation of some new darthuition
machinery. It is illegal for the United blates army to
sell its promerty, and it is certainly littless for it, to give it. sell its property, and it is equally illegal for it to give it away Photographs here available can only be put forth

The gun camera in its perfected form weighs only 13 nounds in all, and has a lens barrel but 8 inches long and 21/2 mehes in diameter It is of metal construction throughout The film magazine is oval shaped It is fitted with a Lewis gun magazine lock, which serves to

nation with a Lewis gui magazine loos, which serves to Soon after the gun earn ra was introduced arguments arous at the traming fields as to which avator first shot the other, when both showd hits on their film. I has necessitated the introduction of some form of time indicator At present the gun camera in photographing

Indicator At present the gun camera in processing as hit also registers the time on the same image.

It was believed at first that the aiming of the gun camera would have to be done mechanically and one had visions of intricate gours and other mechanism

But the problem of anning was solved by a system of mirrore

The gun can registered with relation to the mehts of the muchine gun to which it is attached by first mighting the machine gun on a point a definite distance away and then moving the camera so that the point of the bisecting lines of the graticule fall chactly on the point where able clamping members then it suit the accuracy of aim

In place of the explosive lorce of the usual cartridge, something had to be introduced in the gun camera for driving the mechanism The designers in the present and but at model have made use of a spring which is wound with a handle similar to that



545

TOPOGRAPHICALLY States Island belongs to New Jersey On the north and west it is embiased within the arms of the nighboring state, being separated from it only by the channel of Kill van Kull barely a quarter of a mile wid and the still narrower Arthur Kill The island hes more than five rules from Manhattan and its pearest approach to the rest of the State of which it is a part is at lord Wadsworth where a full mile of water separates it from Bay Ridge At their most constricted separates it from Bay Ridge. At their most constricted part the Narrows are wider than the widest part of the part the Narrows are wider than the whorse part and Hudson River So that in every was Staten Island is disconnected from the other bornighs of Greater New And yet it is a part of the big city and sh tork And yes a so a part of the apoletin sust facilities which have been developed to such in extensive digreem all the rest of the boroughs. At present the only way reaching Staten Island from Manhattan or Brooklyn is by ferry and in foggy weather when asvigation is slow if not positively dangerous. Staten Islanders feel their remoteness from the heart of New York During the recent ferry strikes the complete isolation of States Island then threatened showed the imperative necessity

of tunnel or bridge connection with the rest of the city When the Brooklyn Lourth Avenue subway was projected plans were made to run a line across the lower end of New York Bay to Staten Island. This would urvolve a tunnel some (w) miles in length for it would har ily be practicable to tunnel under the Narrows at their narrowest point because if the depth of water there. This ext usion if the Lourth Avenue subway has not yet been built although the rest of New York has been widely extending its subways and alcosted lines the meantone Staten Island with its excellent frontage of deep water for shipping and its vast acreage of un peopled land has remained undeveloped while its citizens have been paying increased taxes to increase the borrowing capacity of New York and help it pay its rapid transit Hader these conditions it is very natural for Staten Islanders to sturt an agitation aiming to extend rapid transit facilities to their own portion of the city.

They are a decontent to be connected to

Brooklyn feeling that this would be an indirect way of reaching the heart of the city. Brooklyn rapid transit lines are already congested and would hardly furnish the acc sour bechines for ad litt till passeng r s rvi e to and from Staten Isla L The trip to Manhattan Is was of the Louth Avenue subway considering the fact that stops would buye to be made through Brooklyn would probably take longer than the present ferry 11 h direct from the foot of Manhati ii Islaud It has therefore, been proposed that a direct line bu run from St George States Island to the Battery Manhatt m



Various views of the camera gun as well as a sample exposure made on the film

for official purposes! Inasmuch as one of the reasons why they were made was to show America what her sons did and how they America what no sons do and now did it, this is a condition which should be, and doubtless will be, changed as soon as Congress is shown that a law to permit size permanant form of distribution at ocat of prints, is a necessity

Eventually, of course, all these still and

moving picture negatives will be brought to Washington and there kept on file Long

to Washington and there kept on file Long before that happens, a united protect to Congress on the part of all interested—and that means every illustrated periodical and every ollector, every parent of every soldier and every library, museum and school in the nation—should get the necessary legal steps taken to make available to the whole of America, America s pirtured participation in the great war.

### Making the Machine Gun Shoot Pictures in Place of Bullets

N casting about for a suitable method of training aviators in serial marksmanship, it was the British who first introduced the se-called gun camera. This device in its early form was simply a camera patterned after a Lewis gun, with a long lens barrel in place of the al barrel. The gun camera was then a cumbersome trivance, its operation did not aimulate that of a numel barrel genuine Lewis gun, it carried plates for 12 exposures only; and each exposure called for a manual operation

only; and such exposure called for a manual operation. Them the United States enserted the war, and among other things the matter of a satisfactory gun camera came up in due course. As a raw pob, the British gun camera was not at all hed; but after a while the American camera camera cases forth with an idea for making the gun camera was not at all hed; but after a while the American camera c

employed in winding phonograph in items. The spring is fastened directly to the shaft that turns the five-inch real and through to the Geneva cross movement which causes the intermittent action of the shutter and film-shifting mechanism, each time the gun is fired. The film sinfutur mechanism, each time the guine fired. The film is standard motion-posture as it as and un the guine camera it travels from a spool in the small end of the magazine has a light trap where it is exposed and three to a red five inches in diameter at the larger end of the magazine where it is stored until developed. Back guine sames a so ordinarily provided with three magazines which may be louded in daylights.

The 'hits are recorded on the motion picture this in the form shown in the similar of the accompanying dilustrations. The dressed lims serve to indicate the socuracy of aim with relation to the carplane photographed, the white slock did indicates the exact time serve down to the second. A glass plate called a 'grati-

magnetic, now waite surest did indicates the exact time even down to the smoond. A glass plate called a "grati-cule" is metroosed in the lens-harri at the focal plane of the lens, which missage practically in contact with the film. The graticule carries the grown d hors and circle, which are photographed in such image recorded. The developed images serve to indicate whether a given "shot would have proved vital or ret u actual sombat.

Details of the guz camers are green in the accom-

Access to the gan camert are given in the accom-panying enjarvassa. The picture on the right is a re-production of a photograph snapp d with this appearatus, showing that the guanter just missed the chasms of his opponent and that the "abot" was fired at 10 48



Our front-page illustration shows some of the various proposed routes. Route A is a tunnel extending from the Battery to Flus Island, and thouse to Staten Island This would connect with the Seventh Avenue subway line, so that 'staten Island would be brought into close touch with the business part of New York, and also with the theater district. This would have the advantage also, of providing direct tube connection between New York and Ellis Island, and a separate tunnel could be run over to Communipaw to connect with the Jersey Central lines, which now have no tube connection with New

# Better Packages and How to Know Them

# How Government Tests Packages to Improve Design and Develop New Containers for Export Shipments

AN America Railway 1 xpress Company official redeged fact that the average American bissores was regarde a satisfact on timer as a direct seed of the approximation of the

and homogeneous the first of the control of the present of A fullifium of the U.S. Pointed Service states that box makers in the first of Sist's me 4.547.97.180 fort of limber animally of which in divisords constitute. I 18.278.019 fort or 51 per cut and hardwoods 400.005.101 fort or 31 per cut of the total. Practically all of the will use I for houses when product of the several and the reform forms a part of the animal hundred total inside producted in the United States is converted into boxes. In fact the manufacture of packing boxes and shooks crates crating fruit and vegetable packages and backets, is the second largest wood-own saming industry of the United States is con-

The manufacture to our trains untied States is com.

The manufacture of the certain regions determined by
the supple of nav material and the markets for the product

I he manufacturing industries during up products
usually shipped in boxes, and the intensive production
of fruits and vegetables for used markets are the consuming thannels calling for large box supplies. Among
the leading box consumers are manufacturers of oil
packing-house products, cannel goods, groceroes and
tohocco dichting and dry goods, the masufacturers of
hardware, tinware and machines, growers of fruit
berries and vegetables. Crate are used in large quantities by shippers of fornture hardware mechanicy and
stone. There are innumer that there mechanicy and
an innerve fruit raising and market gardening which
centess of these activities together with a consideration
of the sources of timber supply will explain the widely
varving relative importance of the industries in the
several 'states and regions'

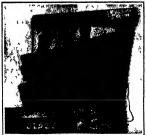
Nearly three-fourths of all the boxes crates crating etc, are manufactured in the region east of the Missussuppi River and north of I cancesee and North C arolina which owing to the extent of its industries offers the best market for boxes, and also embraces or is contiguous to the sources of the woods most used in hox making

### What is a Good Box?

A properly designed packing box is one which has enough strength in each part for the purpose for which it is intended and no more strength in any part than is necessary to balance the average strength in every other packing the part of the data necessary for designing such a box cannot be obtained from observation of boxes in actual



One test that the packing case has to withstand before it receives the official sanction



A poorly made wooden box after shipment by express and parcel post

frequently bears evidence in itself of the cause of the damage, but there is no way of detarmining from a study of the failure the amount of force exerted by the damaging cause and in cases where several causes have been active it is impossible to identify each of them. On the other hand, laboratory studies (made at the Forest Products Laboratory, conducted by the Forest Service at Madsion Wis, in cooperation with the University of Wisconsin) combine practical experience with it is knowledge of the designs in use, of what lumber is available and of hox factory practice, with accurate securite test made on the package itself, packed as in actual service and subjected to strains that approximate actual transportation conditions.

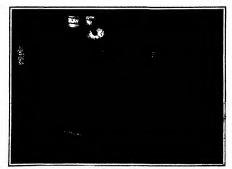
approximate actual transportation conditions. Compression-long-an-deg test, as its name implies, is a steady and constantly increasing pressure (measured in pounds) applied along any edge and with the opposite edge diagonally through the box in a direct line with the researce extend the corner-wise test is applied in the sameway to any corner of the package with the opposite corner in a direct line with the pressure. These two tests measure the strength of the box in withstanding any external pressure and to a limit of extent approximate the hazard of the lower tors of boxs in a pile. By them selves these tests are insufficient to determine comparative weaknesses in the various factors that enter into properly balanced construction.

Another very good test is the drop test, especially for comparing the strength of one how with that of another In this test the box is packed with the actual contents as in service and dropped from a predetermined height directly on the corner which is a fall that occurs in actual service. The value of the conclusions in any runs so rapidly into another that the observer does not always get the true measure of the weaknesses.

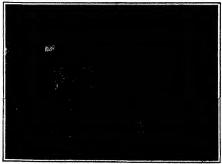
The most practical method yet devised for testing paking boxes is the revolving drum test. The drum is a hexagon-aided machine and revolves slowly. The box to be tested is packed with the actual contents, as in commercial service and placed in this drum. In drum, are arranged a series of haards, which cause the box to follow a regular cycle of drops, falling upon the side top, bottom, ends, edges corners, and flat wise upon a propertion similar to the corner of another box. These drops simulate the usual haards of transportation, excepting the heavy static pressure received by a box in the lower titer of a pile which is setured by means of the compression-on-edge test described slows.

As the box moves on from one drop to the next the observer notes the beginning of the failure of the weakest point in its construction and follows the development of that weakness until the box entirely fails and lets its contents out.

The weak feature of the box may be too few nais, nais of too short a length nais driven in a crack and thus having no great holding power, or some other form of nail failure and the tests clearly show this weakiness. The material in the sides top, or bottom may be too thin so that the shocks of the falls pull the wood from the state of the s



Looking into the mouth of the drum that tests the ability of packing bexes to meet obstacles and come out whole



The results of some tests where beses were subjected in a few minutes to

### The Cockpit of the Transatiantic Seaplanes

ANY landsman who may have been so fortunate as to be admitted to the chart-room and shown the method by chart-room and snown the method by which the ship in which he is voyaging is navigated, particularly if this should happen in foggy weather, will quickly understand some of the difficulties and anxieties of the art of navigation. The writer well remembers such an experience on a run from St Johns Newfoundland to Nova Scotia, when a dense fog slut down on the little vessel two hours out of port and never lifted throughout the voyage The sole means of navigation was the small shells, grains of sand and bits of gravel brought up from the ocean bottom by the Thompson Sounding Machine Comparison of this material with an excellent chart of the ocean bottom, several hundred fathoms below, served to bring us snugly into the harbor of Sydney, Cape Breton It is needless to say that the Thompson Sounding Machine was kept going throughout the greater part of the voyage of nearly 400 miles

But if the navigation of the sea is diffi cult, that of the air is far more so Fog is an even more baffling enemy to the navigator of the air than it is to his brother of the sea Thompson Sounding Machine for his guidance

even if he were able to plumb to the ocean a bottom Furthermore, should there be a combination of wind and fog, the problem for the air-man becomes utterly and log, the pronoun for the air-man becomes arterly bewildering A wind blowing from the north aiross the path of an air-man who is specding east will of course carry him to the south. If his speed were say sixty an hour and the wind speed as in the case of whole gale, were also sixty inlies an hour, instead of his course lying east, it would be southeast. In clear weather and by day he would be able to judge roughly the direction and speed of the wind by observing the direction in which the waves were running. But if he is enveloped in fog he has absolutely no means of determining either the direction or velocity of the wind, or indeed whether there is any wind at all

Chere

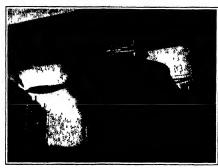
In spite of the fact that dreadnoughts and destroyers of the United States Navy have been stationed at intervals of 50 miles, it must not be supposed that the task of vals of 50 miles, it must not be supposed that the task of flying across the Atlantic even with all the resources of the Navy enlisted in the entriprise is an absolutely simple and sure thing. If a day is selected for the flight in which there is a combination of light winds, absence of fog and generally clear weather, the problem resolves itself down to a question of motive power. If the liberty motors are capable of running continuously for 20 hours there is no reason why all three machines should not make the flight from Newfoundland to Azores without alighting. But if they meet with fog or winds blowing ahead or aheam, the actual distance that they will travel through the air, even if they hold a true course, across the ocean, will be greater and the possibility of one or more of the engines giving out or of the oil supply running short will be in reassed. A forced landing on the water would involve some risk, especially in a wind and

The Navy Department has announced that the navigator of these Navy planes will be assisted by several new navigational instruments which have

heen designed particularly for this kind of work. There is, for instance, the aerusl sextant named after its inventor, Lieuten ant-Commander H. L. Byrd, in which a bubble in a tube takes the place of the sea hormon, a substitution, the value of which normon, a substitution; the value of winds will be appreciated at once by sulyone who has done any air navigation. Often when flying at low air tutudes the horizon is too dian to be clearly seen, and of course when one is above the clouds it is frequently

impossible to see any horizon whatsoever. The navigator will have with him also in his cockpit a projection chart of the Atlantic Ocean, which does away with much of the former mathematical calcula tions and enables the aviator to fix his position in a few minutes' time

The most important aid among the new matruments is the drift indicator which is shown in the accompanying photograph of the cockput of one of the great Navy saplanes. Behind it is standing Leutenant-Commander Byrd The object of this instrument is to enable the navigator to calculate the speed and direction of the



Cockpit of NC-1, showing on the rail the Drift Indicator and below flares for landing

wind both by day and by night I be magnetic compass of which each plane earries three one in the navigator's



The Orientator, which enables flying cadets to obtain flying experience without danger

cockpit and two in front of the pilot's cockpit-merely shows the course upon which the craft is heading. This



Inflated life-raft, which is carried by British airships, in a deflated state

would be sufficient in calm weather or if the winds were coming from dead ahead or dead astern of the ship but if the wind is on the beam the craft even though she were pointing correctly on her cours so far ntinued in pag 60

# Caining Flying Experience Without Leaving the Ground

TIHIN the past f w months there has been perfected an apparatus whereby flying cade a may acquire flying Capcinnee without leaving the ground is the invention of William G. Ruggles of New York City and serves to familianze the beginner with the various loops turns nose dives and so on experienced in trick or combat flying

The Orientator is based on a modifica-tion of the old fashioned universal joint being composed of three concentric rings so prvoted together as to permit the fusciage member which is pivoted within the inner most ring to be put through every possible dution experienced in actual flying Thus the apparatus becomes practically an airplane as far as training is concerned

The cadet sits in the fuseinge and by means of the joystick and rudder controls puts himself through practically all the evolu tions which he is later to experience in the air

Small high speed electric geared motors through high reduction gears to the various parts of the Orientator furnish the power for the evolutions. The joystick and rudder controls close the necessary contacts for the various motors Bi cause of the high-spied motors and great gear reduction the action of the apparatus is prompt and

DONILIVE An analysis of the crash reports from flying schools has shown that a remarkably large number are solely due to a failure to come out of the spinning nosi dive or tight spiral. The only reason that the callet has failed become accustomed to these unusual movements These evolutions stimulate the internal cars which send these evolutions arimulate the farther ears which send nervy impulses to the brain. The individual has no con-trol over these impulses the only thing he can do is to learn the significance of these impulses by experience. The problem is extra mely simple. All that is needed in The problem is extremely simple. All that is needed is that every eader should fly the Orientator day after day until he is entirely familiar with these new sensations Any mistake that he makes causes him no harm because he never leaves the ground. He is then prepared to undertake stunting in the air. Flying training on this ground training inseline should be under the combined supervision of the officer in charge of flying and the flight with the com-

### A Substitute for Linseed Oil in Sweden

NEDISH engineer has succeeded in obtaining a A substitute f r inseed oil from purely Swedish raw materials according to a report published in the Journal of the Swedish Chamber of Commerce in the United Lingdom. The substitute is said to possess all the good qualities of the kenume article. The invention which is the result of long and patent work has been bought and the result of long and pattent work may occur brough a will be exploited by Director 1. Schelin of Stockholm manufacture would have been legun long ago, but for 2-2-x in delivering the necessary machines. The main delix in delivering the necessary machines. The main

is cheap to manufacture and does not need an extensive plant the cost of a factory capalle of turning out 500 tons annually not hing more than 20 000 crowns (\$5,300 at normal exchange). The price of the no muliactured article is very low compared with that of lineed oil

# A Bag Which (an Become an Emer-gency Life-Raft

NVFN11D by a British corporal, the life-raft shown in the accompanying illustration is a most ingenious piece of equipment for sircraft which operate over water As will be noted from the illustration it consists of a more or less circular gas hag in the center of which is stretched a floor of heavy fabric Ordinarily, the raft is carried by the airship in the deflated state but in the event of secident it can be inflated in a few monients to form a most inflated in a few monitude to form a most serviceable raft. The bag is really a series of bags, each being inflated through a separate air valve. Simple our locks and a pair of cars are provided for propulsion

### The Automatic Chemist

Al last the chemical machinel P Is addings of New York has patented a which does not rotate control work better than a college trained expert an Product subject to variations in process rroque a supper to variations in process i from a variable source of supply can be cutinususly meantined at a chared standard by this new system. And it works

Lone of said which formerly varied over a wide range despite inti-rauttent tests by the point circumst are toring constant as per to close limits in pulp and paper mills by this invintion. Dynatuff soap heavy thomand brine ck trobuse in 1 of a works i in also probably use they utomati

In the mecker shown by ways f animph it is desired to produce per cent suffuri it is desired to produce per cent sulfurie send maxture from vamith sources of supply Instead of hiring housest make he determination and set the valves by hand material tenths, charteries are used assent. ate I with composited electrical control

for make metantly the proper adjustment as needed to keep the material to a standard. The appear atter to operate 1 by the thintones of the material itself. By referring to the drawing it will be seen that any varieties. atom in the product will the if upriate contacts sustable re tarded against transcent effects to control automat re tarded against transcent chickers o control automaticary the name at the Auren and restore the moranal conductors in the metanic diluteratud if the acid solution become it, atong the chetrically operated walve, dustre of a convergencing portion of the reagent supply of vice wrom an insert the constitution becomes even slightly to y when in last the feminant neumons we appropriate when has been provided and the matternal to be controlled as privated with it imperature companions and in and thermin anticol when mercany. He only remaining factor is that the conductivity between the fectivations is the thin and contain. As shown is both

rans h and others the conductivity varies over almost a straight the curve within limits for many weak solutions. Other cases have different relations of conductivity to composition the effects being particularly marked at end points bring

esturation etc asturation et
An introvening application under devolopment is the oil floatation process
where definite pervantages of oil and
acidity of carrying bused are to be controlled according to viriable supplies
in many other plants the automates
system can be used in oil antager
Once a qualitative analysis is made and the variable
factor detarmed the control can be accomplished
automatically. Chemical an intent entitle are committed

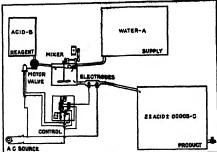
automaticate ( nomina antiferina agen as the secupo of 5th, or halogens du to uncontrolled ar congested processes are obviated by the automate system and

an alarm may be provided to warm of such unfore-son a troubles

the automatu chemist is an assestant and a the trained chemist beroutine control work and permits delivery of stand and products at less cost by non-automato nu thoda

### New Styles in Rivets

IN speeding up our in dustrial machinery to the penit where it would supplement most effer tively the efforts of our military to strat the Hun there was no detail too small for the attention of our enginers I ven sin h an apparently trivial con aderation us the best shape for a rivet got its share of careful discussion mare or carvill distunced. To the layman it might seem that a river which is going to be heated red bot and then prunded into place might equally and indifferently be any shape.

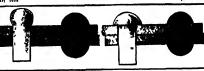


The automatic governor for chemical reactions, which regulates exactly the proportions of a mixture

at all that the process of beating ind pounding would make it fill the hole. But this is not the fact. The ordinary rives has a browled head on one end and is headed only on the other life; going into the hole



The rivet with unfinished head simplifies



Showing how a propared rivet hand (right) fails to fill hole, while one shaped by the riveter (left) is an airtight fit

The flow of metal from this second ind fills that side of the hole all right enough, but on the side of the prepared head, from which there is no flow of metal, there is a tendency for the hole to remain not quite filled, as indi-

d in our stat. He the efficiency mas who responsibility for the production of our yards proceeded to design a rivet which of fill the hole completely under the had responsibility for the production of our shipyared proceeded to design a river which would fill its hade completely under the gentle marristens of the meature. The result is a revet which has, on its prepared upper end, and ye seeped to has been seen to from falling through the hole and out the other and when the sin nearest most her rivering gust pot mits seelin sugard a principle of the hole, and the hole is accordingly filled tight. Herotofore, in large constructional work, it has been necessary to ream the ravet holes so and to have a perfect file for the rivet. With the bulls-head rivets such precautions will not be necessary because the rivet will be made to fit perfectly by the pounding of the riveting gust.

pounding of the rivoting gun

Another interesting development in
rivoting science is seen as a natural con-10000 a revenue as seen as a new started escape of the Rivets on the Sambed sequence of the Rivets on the Sambed and asset of the Rivets on the Sambed and asset, so under the old system it was necessary to early in stock a variety of revets. Now however, the only thing the the mass of the shank, for with the head formed during the process of driving the rivet, the single shape illustrated takes care of all demands

### A Megaphone of Novel Design By F R Watson

rel Physics Unit

Professor of Raperiesseal Prysical Undersely of Illinois

Till megaphone in common use is cone-shaped in concentrate sound along its axis, so that it is well sound so the state of the contract of the contra

depots It would not serve the purp sound would then be directed up and do

and prevented from passing sideways as intended.

The directive action is due to the diffraction of se according to which sound waves emerging through a

narrow opening spread out in a circular path with out in a dirouse pass with the opening as a center When gmerging from a wide opening, they pro-ceed with practically no adewise spreading Fig 3 shows these affects where on the boundary emerge through the proceed with little of ngh the larger of

ifed Any some stell in the fest-of jest will be prosing



Pigure 2. How the slot magaphone reprodu



# Our Trans-Atlantic Dirigible Entry

Some Constructional Details of the U. S. Navy Dirigible C-5

HILE it was to be expected that the houver-than-air cent would not have things entirely their way in the matter of the trans-Atlantae fight contest, the contemplated entry of the U S Navy dungtemplated entry of the U S Navy comp-ble C-6 is one of the greatest surpress or acreasutioni eroles to date. Aumen had been looking forward to the entry of one of the large British dirigibles, but little shought had been given to the possibilities of the smaller dirigibles of the so-called

shoughe had been given to the possibilities of the smaller drighbies of the o-called Riliany class

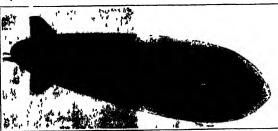
With the successful consummation of the first key of the great flight, namely, the possibilities of the great flight, namely, the possibilities of the great flight, namely, the caresume sestency and of Long Island, and Sa John's, Newfoundand, the diruphle will have made the flight, at any rate, this present plans call for a non-stop flight between Newfoundand and the Lagish cases. It is reported that there battle-shape are already statuoed along this route, the "Uhah SOO miles out, the Hunda 600 miles beyond the Uhah Arkaness about 400 miles from the west oceast of Ireland If the west oceast of Ireland II the Ireland II the west oceast of Ireland II the west oceast of Ireland II the west oceast of Ireland I

The C-5 is one of a number the Case and a summer of twin-engined dirigibles of that class measuring about 192 feet in length. In fact, the Navy first engaged in serious arising work in 1917. before our entrance into the war, by constructing 16 small before our cuttance into use
war, by constructing its small
daughlesof the single-regimed
limp type I hear, were
designed from a proture on
the bosic of a post card that
was smuggled out of langiand
and from an assount by a
returned traveler who had
seen something in langian
that he tred to describ.

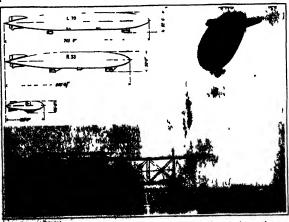
The Generoment already had sees sometime in January that he retreated in January that he retreated in January that he retreated in January that the Languary ware working on a certain season, and that the Uppe was useful. The drugble was practically as has queupped with an airplane fueskap, and from the meager information the Navy set to work designing and bruiking our library to the large that the Bristia to see, proved to be very much the amount of the sees of the property of the property of the property havy library measure 164 feet in length measure 164 feet in length and have a gas canaenty of



Gendela of the C-5, showing twin Union engines of 120 h p each



The C-4, a sister skip of the C-5 as seen from below



roon a Navy NC best and a C-type dirigible, and a diagrammatic of our small dirigibles and the German L-To and the British R-82

with along Atlantic constal waters through out our period in the with and have arted as corveys for whole fleets of increhant ships They have r ily been useful for that hunted function. However as Comthat hunted functor. However as Com-mandi J. C. Hun sher of the Burnau of Conservation and Itapan. Navy Dipart-ment scentify part if art they crossly so year far to see her, as they have only one rugue. Indeed they are now on record where a few hishes not if the registraught-ing the seed of the particular of the particular interest and in a high see andition difficilly for their class and team of down at the few. at Halfax Their being sweat was nore good luck than management have the U.S. Navy decided that two common I 5 Navy decided that two cas Navy decided that two cagmed dungatic was dissirted and ion atrusted

mention

So we one to the Cobos of Naxy
dutable in stat which are equipped with
two Hispanic uncarringues. This draign
has maily two the gas capacity of the first his many two the gas capacity of the brit model and the spaced has been pushed up about the sum. The ships with the tring cognits are still fairly new but the first ms of the some has flown from Akron to Wishington then to Ruckiwas and more

thin to Ruikiwas and more
rintly from Ruckawas to
ly Wist Illu longest flight
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lull or holy 40 first long, and suspinded about 16 first lelin the gas ling lusting 1 O Complett the directional pild securics the ctional palet securities the cuoses and securit the bow of the buly. He sluty is to leep the ship on its path and stars in a horizontal plant. I but I b number I W ( oil and the two of them navigate the two of them managed and change the televieron to the balloon merche to take advantage of the balloon merche to take advantage of the order of the prior of th sine meinding the twin en kness can be tracked by negres of communicating KRIES IV

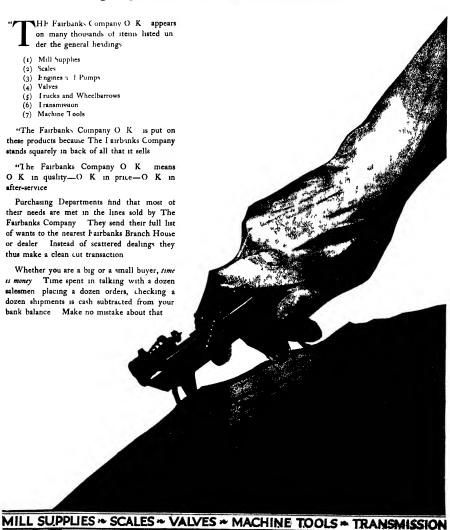
pressive of commonicating gauges ave.

The principal feature of the C.5 is the surpressingly loss immonipation of the Cwin for the Common type and the Common type most of of the bound lapses, about 120 keeps power most at a changing of the common type and type

the C-5 is thus able to travel some 1 250 miles in still air at high speed and consider-ably farther if bicked by (Continued on pag 361)

# THE FAIRBANKS COMPANY O.K.

# -what it means to Purchasing Departments of American Industries





\*TRUCKS & WHEELBARROWS \* ENGINES & PUMPS

10 DE

# Inventions New and Interesting

A Department Deveted to Pioneer Work in the Arts

### A Sut of Armor for the Tire

THI RI is a certain type of inventor who is never satisfied that the current way of doing anything is the best and who is continually devising what appeals to him as new and improved ways of meeting old and familiar problems. And one of the most fertile fields for such a pacumatic tire for tires will wear out in spote of everything that we can out in spite of everytting that we can do about it sud the problem of the traffic man is to make them went no long as possible. It is too tires will slip especially when we put them on heavy automotiv velucles so in the to produce a tire that will wear and that won t ship.

Of course within the limits of the rub Of course within the limits of the rub bet tire it can be done the non-slipping feature has to be uncorporated from with our in this shop of chains or offin tackle of some soft. On the whole we believe that the chain of standing type has been found about as satisfactors as any other means of chimnating skidding but or casomally one of the thronically dissatisfied inventors comes along with something that is at least good enough to prevent us from dismissing it with a laugh or a strug of the sheulders or a significant tapping of our collective for

We illustrate the latest thing of this sort to come under our observation It is really what our title implies—and not merely armor, but chain armor as well for it is flexible and is wrapped around the tire much as a medieval warnor might have wrapped a shirt of mail about his anatomy if that is the

This armor in the present case is made up of rectangular sections of the toughkind of fabric bearing a series of circular iron plates as illustrated Lach of these sections is hitched to its neighbor by means of the bttle square-round bak shown, in our lower left-hand cut wired to the end of the section for shipment It will be realized that when two adjoin ing sections are hooked together with one of these at each side and then subjected to a strain that tends to pull them apart they cannot yield to that strain-without breaking the buk. The whole chain of scations is thus put together and wrapped about the tire and the final joint is made with a little tool as shown in the upper one of our three pictures. Then the tire one of our three pictures looks as at the lower right a surface that makes skidding unlikely to say the least

The conspicuous advantage of this outfit is that when as happens to every anti-skid device sooner or later, one of the sections gets worn out smooth if can be removed and replaced without any effect upon the rest of the protector without any cost except that of a nev section Then the tightening links by means of which the thing is clamped on the tare make it possible to put the protector on or the it off without deflating the tire and at the same time to keep the protector tight under all conditions. I maily made in sections as it expels mud water sand an l gravel through the openings between the sections and so keeps itself and casing comparatively clean and dry, but while doing this, it covers one igh of the tire surface to constitute excellent protection against puncture and blow-out and other hasards



Patting on the tire protected



Sectional protector for the tire showing a single unit and assembled protector



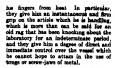
THI laboratory worker is frequently confronted with a situation in which he has to handle with his hands a tube or retort containing a boiling liquid Naturally this is not to be done without precautions of some sort, but the pre-caution ordinarily employed is usually a caution ordinarily employed is usually a makeshift of some sort. A scrap of waste the corner of an apron, or some other fragment is allowed to act as buffer between the hot glass and the flesh. Our



A French suggestion for handling hot mixtures in the laboratory

Parisian contemporary, La Nature, illustrates a very handy little device in-tended to replace this more or less undesigned for the purpose in question.

The putture is self-explanatory, and it is obvious that these little finger-stalls of subber are less conductive of heat, less liable to leave a portion of the finger un-protected and altogether more workable than the hit or-mus methods which the chemist employs every day to insulate



# Heating Water by Means of Electrolysis

THE heating of water by electrical methods has hitherto been attended with no great measure of commercial success, partly because the apparatus has been too cumbersome and complicated, according to a German electrical engineer And to prove his assertions he has devised two ingenious systems of he has devised two ingenious systems of heating to boling any required amount of water. In atther case is any special heating element required, the water taken forms the electrolyte. Briefly, the apparatus consists of two or more plates our cylinders, which are autably arranged beside one another and form the ele-

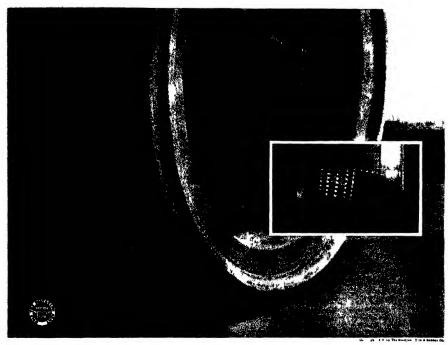
The simpler form of heating apparatus The simpler form of heating apparatus is shown at the right of the accompanying engraving. Three carbon plates, A B C are used, about eight inches square, arranged in parallel to one another at a distance of 0.4 inch or 0.6 inch, and condistance of 0.4 inch or 0.6 inch, and connected together by an insulated boit D. The plates are also separated by insulating rollers. The rods A\* B\* C\* serve for introducing the current. The apparatus is intended for three-phase alternating current, and can be regulated by outting off one of the three phases. The apparatus is directly not one of the other phases. current, and can be regulated by conoff one of the three phases. The apperatus is dipped into the water which to be boiled, and can be used on any
with any current. The carvoltage or with any current. The car-bons will last for an indefinite time, and bons will last for an indefinite time, and as no heating element is required, con-sisting of couls and the like, repairs are likely to be negligible. The apparatus is always ready for use and is quite as efficient as anything else on the market for a similar purpose, seconding to its German inventor.

It is said that carbon is the only sub-stance that can be used for the plates, because metallic plates soon disintegrate occases measure peaces soon distinueurate and oxidise. Zinc plates become covered with oxide and carbonate, copper, tin, iron and nickel are equally unstatable

with occue and carconase, copper, tim, or man and nicks are squally mentalities of the control o conducted in winter when the condition were uniavorable, in summer there is lose from radiation. If 30 or 30 angu-are not available smaller plates sin-uncd, or the plates one be separable. The greater determines; but in each came-beating requires longer lims. The other species is discuss as, the li-in this case the water is instantly, has in the one and placent of a few co-



Two systems of heating water by electrolysis, which have recently been washed out in Germany



"FIVE Goodyear Solid Tires, which have passed the 50 000-mile mark on one of I our trucks, undoubtedly will last another year and give us a total of 75 000 miles of continuous service. Their treads are still 1½ inches thick. Due to an accident the sixth tire in the set had to be removed at 50,000 miles otherwise it too unquestionably would be delivering like the other five today. Our experience with Goodyear Solid Tires makes it easy for us to realize why so many truck owners specify Goodyear: "—J J Callahan, Local Menager, John Wood Manufacturing Company Brooklyn New York

Thus far a total of 300,000 miles of service have been delivered by the set of six Goodyear Solid Tires described above

Yet it is apparent that even this extraordinary figure will be increased because the present condition of five of these tires indicates that each will run 75 000 miles—the sixth having been injured as the result of a collision

When the un-retouched photograph above was taken, all five Goodyear Solid Tires had traveled 50,000 miles and still all were as smooth and thick with rubber as the two shown here

Although these Goodyear Solid Tires have consistently carried heavy loads of boilers and tanks over cobblestone

pavements and into plumbers scrap strewn storage yards, they offer little evidence of having done so much hard

Certainly the appearance of the veterans affords visual proof of their freedom from chipping and shredding, a feature broadly noted in Goodyear Solid Tires

While the mileag given here is unusual it is well to observe that it has been equaled and even surpassed by other users of these sta warts

Thur reports of high average scores plainly show what Goodyear Solid Tires plus intelligent care can do and thus draw important attention to the effectiveness of Goodyear methods of solid tire manufacture

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO



### Recently Patented Inventions

Brief Descriptions of Recently Palented Mechanical and Electrical Desices, Tools, Farm Implements, Etc.

Perintaina to Aeromoties

POINGNOIS NATOR UNINKRATOR POR
AIRPJANEN G. II. C. van Short Hilla N.
J. Ib. lavonition relates to attachments for
alphanos whereby pole in it vajors may be
presented in such a way that they will not affect
person occupying the alphane while leaving
behind a polaronous atmospi. T. An object is it
provide a device while real to easily controlled. by the pilot and is adapted to utilize the air current created by the speed of the machine in

dight

AIRPLANE -G I literanan Simulsoro

8 O An object of the invention is to provide a
bracing arrangement for our july lines withel involve
the construction of a plurality f industric narrow
attribute writing on own side it full holy these
wings being reperate on a terrel ce cleen the filedibood
of the total detertuien if the wing structury on
one or the other side is a well directed shot in
combat.

combat

AIRPLANE -() W Hotha Harre Vt
Among the principal objects which the invention
has in view are to increase the propelling feature
of the driving mechanism with which the sirplane is provided to increase the invitation to regulate
the flight and to check the flight of the airplane

### Pertaining to Apparet

DETACHARIE EL RICOLLAR FOR COATE DETACHMENT R' IN COLL IN FOR CHATM.

A H SHERWIN CARE A HALVEIN & BORG 715
Broadway New York N Y Fhe Invention
relates to wearing appared and more particularly
to couse for object is to provide a fur reliar which
can be readily placed in position on the resularl
and permanent cloth rollar of a coat or n moved therefrom whenever it is desired by the wearer Another object is to permit the use of the fur collect on various styles of permanent coat collect

### Electrical Devices

ELECTRICAL WATER HEATER -- J ELECTRICAL WATER HEATER—J. C FEDIMAN 1800 Times Bidg New York N Y The invention relates to automate electric neares Among the objects is to previde a structure of relatively small dimension seeds it mapores in ones arisy for easy attachment in any con-resions electric play or saked. A ruther object is to provide a switch whereby the inextine current ss to provide a switch whereby the leading current will be completed automatically with the simple movement of the delivery valve to open position for host fluid but which is inoperative when the same valve is turned in the opposite direction to deliver cold fluid

TROLLEY HARP -A J Kowages 3509 TRULLEY HARP—A J Khwazis 3509 22d fit Washington D ( Ihe invention relates particularly to the construction of the harp the manner in which the trolley whiel is supported thereby and is normally allowed full flexing caccooy and a normany subvers in nextney movement with respect to the bary and residently maintained in connection with a troils wire and is locked immovably in connection with the harp when the controlling cable or wire of the troils; pole is manipulated to lower the latter or manu-ally shift the same in lexating the trolley wire

### Of Interest to Farmers

POTATO PLANTER E F MENDENHALL Kilgore Neb The invention has for its object to provide a planter wherein the cuts are taken from a hopper in succession and delivered one by one into a dropper chute and wherein a furrow opens



CONGITEDINAL BE IN N SHEET IN THE PLANTER suts and covering mechanism for covering the ruts after they have been dropped and other mechanism for simultant sats lifting the furrow or and covering mechanist an I disconnecting opener and covering mechanise—and I disconnecting the dropping device from its of easing mechanism

the drouping deviet from its or each tag mechanism. REVERBILLE, TEAC (1988 11 OW R. TURERS 11 HE OF THE SEASON 11 HE OF THE simultaneously and for raising and lowering the

In permitting area to be componented for thesi is bandless boson or the like wrapped with cord or for permitting the points to be inapplicated when work away to its original dimensions the point for heaving a complemental cord or the point of the point

next the plant to the standard

\*\*\*PRAYER\*\* — 1 PLUMEN\*\* North End

\*\*\*RAYER\*\* — 1 PLUMEN\*\* North End

\*\*\*Ration Detroit Mich An object of the invention is to provide a spraing apparatus which

is adjusted to be adjusted to said various widths

is rowed plants and which is provided with a jet

of very simple form to control with facility she

discharge of the water from the outlet offices in

the spraying arms or to entirely cut off the flow

PLOW F MANNING Genesco Kan The general objects of the invention are to provide a plow so formed as to effectively shed the turnsed ground and to provide a revolving clearer so



A TOMBTOBINAL VERTE AT ARI PIOP

formed and so arranged relatively to the plow as to maintain the latter clear of weeds and track the action of the plow and clearer to be such as to cause the trash to be deposited on the surface of the ground and uncovered to form a mulch the action of the ploy and cl

Of General Interest
P(IWDER PUFF B 11 KARREN care
Voluntum Powder Puff to 140 Vixth Ave New
York N Y a specific object of the invention
is the employment of a suitable member such as a this dish or plate of cardboard which lies within the upper shell of the powder puff body and between which and the said shell the ribbon is clamped with the cides turned back under the cides of the member and held by the upsetting of the flange which carries the pile cloth thus doing away with the gitting of the handle-forming

WALL CONSTRUCTION A HARDON WALL CONSTRUCTION A HARDON COURS IN SECTION 18 NO HOLD THE MEMORIAN IN THE MEM such header parity overlapping and bonding the channel brick in adjacent rows or courses and simultaneously closing the openings

simultaneously (tolent the openings PAPP'R KOLJ RAK K.—F and F T Wistran-Marker 2008 (happin Avr. Jersey) (ky N J An object of the livestion is to provide a simple and the second of the livestic and the second of the livestic and livesti

DFN9111 METER—( N Sowden Santa Clara Central Caracas Cuba The invention relates to a density neter through which liquid the density of which is to be measured may flow continuously. The object of the invention is to provide a simple and efficient meter any variation in the density of the liquid passing through the device is shown by indicators

usly is subsented on the check and inked to pro-CIFANNO DENIGES. Il Harny Box, vide a distinctive mark. The device comprises 2.2. Gibson (19) II be invention has for its other to provide a device for removing stones.

handle at a minimum cost

CURTAIN SUPPORTING BRACKETS —

CUM Prime Long Beach Cal The invention

bas for its object to provide a device capable of

quick and easy attachment to any casement



without marring the same and without the necessity for nails screws or the like and wherein means is provided for supporting a blind as well as the curtain the curtain supporting means being adjustable

disclose the usual fabel on the hottle
Fit INING APPARATUR F Serum 32
Rutherford Are Trepton N J The objects
of this leaveston is to provide an apparature
arranged to lineare proper employing of a water
close or selfs, tank for fluiding purposes through
a subhering arctice of the constants of the prooptal and an absengement redding with water
Anothen object is to dispense with the numerous
metallic fluiture likely to correct and now zone. etallic fixtures liable to corro ally employed thus insuring a longer life to the

1 ROCESS OF PRODUCING LEGENDS IN BLACK ON MOTION PICTURE NEGA TIVEN ( I are Box 358 Fort Lee N J The invention relates to motion picture photographs invinitois relate to motion picture photographs as I has particular reference to the process of preducing legends titles has ripilous or the like on m tion pature films in a manner that is most expeditions and cheap and which moreover is capable of the best possible illustrative results capange of the news possible mustrative results (HFC & PROTECTOR—R W Branch 238 Railway Exchange Bidg Kaness (its Mo Into invention has for its object to provide a pocket device of the character specified by means of which the monogram of the draw



BE 'TI IN SHIPWING LARTS IN WITHDRAWN POSITION AND VIEW OF MONOGRAM

CLFANNO DENIA — E. H. Harry Box, L. Glibsen (15) HI he forms to provide a drivit for removing stones or serve that the provide a drivit for removing stones or serve that the provide a drivit for removing stones or serve that the provide a case carryints to stonder refers and a like part similar vene tables. The device comprises an intended trought a feed longing a separating tank. He was the provide a container of page or similar to the provide a container of page or similar them and they are then only a sale page and the sale material and once especially designed for RAFETY CAICH FOR IRROW REW—O I remove the containing district, trans. See cream or other hards to be with the pire will be particly looked in a fact he by which the pire will be particly looked in the second of the driving of the provide a container of the driving of the provide a fact he by which the pire will be particly looked in the second of the driving of the provide a fact he by which the pire will be particle with the provide a fact material to allow convenient shipping and the fact he provided the provided as the provided of the provided and the provided

the framou may be moved relative to the other continues or seatering purposes means being provided for societing this traction, wherein on both framous fine sections, and the seater of the section of the section wherein or both framous fine sections wherein the section of the

COMPOSITION OF MATTER : POI TEMPERING STEEL—E. A HALBERY Clear-brook Minn. The object of the investice is ex-provide a composition whereby steel out he hardened without danger of enclosing the steel er warping the article in tempering. The com-position consists of the following proposition. Alexa, by position in the composition of the com-substantially the following proportions: Alexa, by position and the position of the com-tantial of the composition of the com-position of the composition of the com-tantial of the com-tantial of the composition of the com-tantial of the composition of the com-tantial of the composition of the com-tantial of the

PNEUMATIC TRIGGER PULL FOR FIRMARMS.—A BOTFON 1800 San Pedro Ava., Ramis.—A Romar An object of the investical is to provide a preumatically actuated mechanism San Antonio Texas An object of the invention is to provide a prenumatically actuated mechanism to represent any experimental properties of the properties of the properties of the properties of the operating them as internal application of the operating force, the preserving the equilibrium of the finears. Irrespective of how suddenly the operating force is applied with this drvice a single operator can control an entire battery of machine guest or automatic rifles.

automatic rifles

BROE BIKEL FARTENER — H Varwio and

F Catuwat. 7510 Cornolis Ave Cincinnat.

Chilo The invention has for its objects to provide a device especially adapted for counseling
wooden bords to indice above therein means as

provided adapted to be stranged between the held

and the sele to connect the held to the sole with
equit the use of sails in connection with the sole.

COOKING UTENSIL -C V TIMES 222 COMING UTENSIL—O Y TIBER our Fourth Avo Oakmont Pa The invention re-lates to cooking utensile adapted to be used as a double boflor a steam cooker a canner or pre-server a pudding cooker or as a cooker of vege-



PERTICAL BE TION OF A COORING UTENSIS

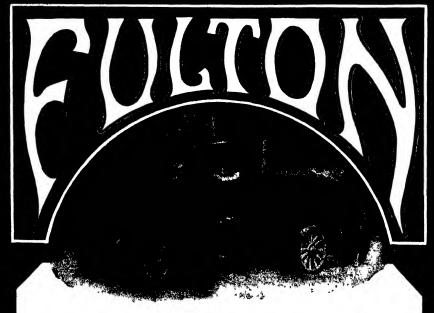
tables recreak or the like An object is to provide a utensil the economical use of water in which makes it practical to leave the utensil on the fire a long period without danger off the food being dried out the utensil is readily convertible, the outer and inner vessel being used separately

desired BABY COMFORTER—MARY Wilson Princes St Northcote Auckland New Scaland The investion relates to a conforce and technique derice and particulary to a device made of existence and so a district made of a child is mouth Object to provide a comporter formed of two main sperarble members excepted to be readily cleaned and maintained in a mixture constitution.

SAFETY RAZOR — W F Cary 208 East 54th 8x Chicago, III The invention relates to the control of the control of the con-trol of the con-which they are bed for charying An object is to provide measure whereby the blade may be grasped between the thum and make for selvopping so that the streeping may be done after the confinery measure.

FLAG CONTROLLING APPARATUS --FILM CONTROLLING APPRATUS—
A MILLEN 70 Greenwood APP East Ornage,
N J Among the principal objects which the
levestion has in view are to maintain the sewine
relation of flags to avoid injuring the flag while
relation of flags to avoid injuring the flag while
relation of flags to avoid injuring the flag while
relation of the provide of the contrage
of the dwine view of the contrage
means for readily desirabiling the fevious upon a
flagstaff.

AUTOMATIC SPRAYING BOTTLES. L. K Monley, 471 Park Ave., New York, 87 Y. The invention relates to desicate so waying the throat for example, with an initianitie absolute and more particularly has in view a commission.



# One Fulton—Then Three More

Four Fulton Trucks are handling transportation for Wm  $\,G\,$  Dann, Ice and Hauling Contractor of East Orange  $\,N\,$  J

Every one of these sturdy Fultons is averaging under all road and load conditions 12 to 14 miles to the gallon of gasoline

It was their speedy, economical delivery of dependable power, whether in gruelling hill work or along level roads, that was responsible for this contractor s first Fulton Truck being joined by three more Fultons within a year—again proving Fulton to be "the repeat order truck"

And it is this dependable low cost delivery, likewise, that has placed Fultons in the fleets of such great national concerns as Standard Oil Co, Pittsburgh Plate Glass Co Borden Farm Products Co, Inc Texas Oil Co John Wanamaker Walvoline Oil Co, etc

Do you know the Triple Heated-Gas riotor? It is an exclusive Fulton feature—an important factor in the recognized economy and power of Fulton trucks

Fulton efficiency is continuingly shown in reports of I ulton Users
Ask to see them

THE FULTON MOTOR TRUCK COMPANY
At-The-Port-of-New-York
FARMINGDALE, LONG ISLAND

DEALERS

Fulton distribution may allow for further extension in your territory Write for details

"The Repeat Order TRUCK"

spring and laver sprayer for home use and em-ploying a solution charsed with carbonic acid gas thereby promoting facility in the use of the sprayer over aprayers of the type employing a bullion the like

with or the Bis 

VILG ANTING 1111 W E More to 
santa Basinas et al. The Invention relates 
the Basinas et al. The Invention relates 
use in violantiality in which as important dissideration in the assurance that the composition 
will promptly gaint and divology the required 
unitalizing the local over the required period 
for composition in make up of associated to to 20 
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DELAY ACTION DETONATOR I I & DETA ACTION DETONATOR 1 | k and, Friconiums 144 Haimm Av. 1 elbam Woods N. Y. The invention relates to high explosive devices with respect to other military or commontial uses. Young the objects in to provide a desonator or opposed with a slow or time controlled from and associated with means to trans in the offset of the fuse to the main charge of the high explosive.

CHEMICAL BASE DETONATOR -P L E CHEMITAL HASE DETONATOR —P. L. E. DER FING CYRN 144 Harmon two Pellams Woods N. Y. The Invention has particular reference to continuous shells charged with T. N. Tor the life, requiring musual means or facilities for detonation. An idject is to provide a belief explosic after lates to the little provide and the many lates of the shell and preventing the many lates of the shell and preventing promastice corphomor, even after the fired.

and collapse permitting the water and steam to escape and extinguish the fire

(UIVERT M R Day Box 192 Bradford II. The invention has for its object to provide, culvert formed from hellow tiles formed from lastic material capable of hardening the tiles



MEAT WALLS

being placed and to end and having means in connection therewith for permanently locking them together and to the head walls and wherein a continuous compound reinforcement is provided

BOOKBINDER J J RALEK address H R liunting 368 Main St Springfield Mass This invention has particular reference to tem ma meetion has particular recreative to the povery binders for newspapers magazines or the like Among the objects is to provide facilities for binding or helding periodicals the several units being adaptive to be attached or filed in an easy manner the assembling may be removed and replaced but whether complete or not may always be handled as a single complete volum when detached from the hinder

when detached from the binder

SHIP 8 PATH H=1 C WARNER and R W

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SHIPS IOG — I MAKEN (a 0 of 9 9 Monus Pier 49 New York N Y Among the principal objects of the invention are to provide principal copie as on the invention are to provide means for repeating at the maxigating officers station the in itsation of the taffrail instrument of a ship a long to provide means for continuously showing to the maxigating officer of a ship the variating long individual one and to simplify the con-struction of the mechanism necessary to accom-

RECENTLY PATENTED INVENTIONS other strictes of however rhendry to finish the particular to the particu

changing of rubbers.

NON REFILEMENT CONN ALNEE — P. Res.

NON REFILEMENT PUBBLE SHOOM. Mentirubbers with the problement of the rubbers of

broken off
ATTACHMENT FOR RIBBON ROLLS—
W A JUMANNAN Paullina lows The inwinting relates to a means adapted to be attached
to a ribbon roll to hold the ribbon and the usual
paper strip from andidated unwinding. The
general object is to provide a member having
means to detachably secure it to a face of the usual paper or pasteboard drum of a roll and reby the attachment may be us

DOLI S DRESS—J BAUK 1996 Sedford Ave Brooklyn N Y The object of the innutrion is to provide a doll a dress which from a permanent part of the doll. The dress comprises a both naving sleeves and less formed of brail of a talli material in braid being arranged in a layer account the body—runs and legs of the doll and stitches fastening the edges togeth

### Rardware and Tools

MRENCH T F MILLER 24015 Pacific Ave Tacoma Wash The invention relates generally to wrenches but more particularly to a quick adjustable wrench which will fit various types and sizes of nuts and which may be readily adjusted from the handle in order to bring abou proper engagement of such nuts

VALVE ORINDER — D ROBELBANE \$56
Milliani St. Honoldu Territory of Hawzii
Phis invention relates more particularly to a
valve grinder for use with the valves of internal valve arinder for use with the valves of internal combustion entires insuring the eripping of the valve and facilitating lie removal and manipulsa-tion of the control of the control of the con-serum cup adapted to be sufficient includes a scena cup adapted to be sufficient with the sense aren on said rup as the lack a stubular holder lawing threaded cogagements with the sense a lawith shank and means loosely securing said holder at its rate end to the form of odd for the shank

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bits a much higher grade of tool steel can be used (OMBINATION I ATHE FOOL — J Warat 1.4 378 724 ft New York N Y A specific sobject of the investion is the povidance at soil solved to the investion is the povidance of a tool beginning to the solved of the povidance of a tool beginning to the solved of the povidance of the control the solved of the

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work or garment to be operated upon HORSEVIIOR < Francosom 306 80 Handdoph 5t Champaign 111 The invention creates making the second of the sec

### Heating and Lighting

WATER HEATING SYSTEM -V E DAVIS closeling to the lost ignation office of a slipe the control of the residence of the residence and to sliped to the control of the residence of the mechanism necessary to accomplish the object of the residence of the mechanism necessary to accomplish the object of the residence 
Micobines and Montaclinal Devices
DITCHER AND ORADER—F. O Securiorses address H M Kidder oble and Main SecPresson Nob This Investors relates to a
restor-driven associate states for distance
last grading and this work. An important object
last produce a rotary custing short wheat open
stary in a manner to effectively cut the ground
and pirch the cut material cuto a conveying or

HESSEMER CONVERTER -A HEADERNEY CONVEYED BEAT ROUTH VAR-OUVER B C CANAGE. The investion relates more rejectally to Beasemer converters of the side blown type in which one or more twysrs are used



An object is to provide a converter of this typs with a wind box having a knock-out back. This is accomplained by cutting away the shell of the converter the full length of the wind box thus providing a space whereby the refractory thing may be easily removed or replaced

may be easily removed or replaced

(IPPEE ROAPTER—E T flanors address
Miss Holley 4528 Ross Ave Dallas Texas
This invention relates more particularly to

1.1.291 granted to the same inventor which
among other binage is characterised by a reassling
drum with electric basting means, and by a
sus tion means thus dollar away with notices
from the control of the control of the control of the

flav nition are to provide a reaster which is mail

tave and with which as increased conservation

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offer the agustion of the coffee white reasoning

FMH0088100 AND PRINTING MACHINE

-B & Coulaw and & Training 400 Pearl Ht
New York N Y The Invastion relates to
machines for embousing and primiting letterheads,
business and whiting carries and other stationers;
by means of a die or engraved need palse. The
object is to provide a machine with inching and
whome devices arranged to insure proper inking
which are the part of the convenience of the contraction of the part of the convenience of the contraction of the part of the convenience of the contraction of the part of the convenience of the contraction of the part of the convenience of the part of the any attention on the part of the operator and without waste of the wiping material

without waste of the wiping material (ENTRIFUGAL CARTING BOX.—G. C. C. aux care Lussran Hotel 70th 8t and Auster Care Law Country of the Coun

ready removal from the box

\$U.PPORF FOR EXPANDING METAL
ARTICLES—B Assacs Succors de Absrea
fien Juan Porto Rico Armong the principal
objects which the invention has in view are to
avoid unequal atepassion of most articles when
rhosains the same to savid unequal stresses in
articles of the character mentioned during the
articles of the character mentioned during the
rhosains and to equalise the internal pireness of
consistent and up in articles within rebesting the
principles of the principles of the control of the character
and the results of the character of the character pieces.

Railways and Their Accessories RAH CLAMP —O O BORDSON Cross Plains
Wis The object of the bavesation is to provide an
emerge ucy rall joint comprising fish plates
adapted to embrace the rall ends a classif for



ping the plater on the relie at each end of the each chang comprising a pair of her of at their union make to it the detail their

or the first places, is both applicables the biggs means as the lower units of the back for its said each restraintly and the tenter into

TRAIN STOP -W H Lowell and SC. T. TRAIN NTOP—W H. Leweste. used Mr. ft. Verrore 12 B. Cremps Ave. Learnester. No. The invention relates particularly to determine the control of the control o

operating said evitch

Ferninaling is Beceveration

TOY BOAT—J Korn, 11 E 17th 8s, New
York, NY A no object of the investion is to
provide a toy in the shape of a ship or other
settles with movehin parts and a releasable could
for holding the parts together whereby when he
object is throven or note spaints the ocitic field
parts will be released for giving the effect of beath
being blorum pip year angiptive beld.

tents under up in an expusive season.

Persimining as Vehicles.

WHERL—W 8 WATEON 610 Hippodrome
Bidg Cleveland, Ohio The invanion relates
more particularly to the hult construction of a
wheel An object is to provide a wheel which
of all steel construction, and whose parts are made of all steel construction and whose parts are mid-by stamping or punching from steel plates and to provide in a hub means for placing uniform tension in spokes thereby equalisting vibrations shock and result by clongation and construction is curved spokes arranged in pairs.

curved spokes arranged in pairs

TABLE TRUCK—S C Dobsov 2304 E
Payette St, Baltimore Md The invention
relates governly to cruzink for transporting
relates governly to cruzink for transporting
struck for marchandiss of every description by
manufactures expalse of uses as chedding table,
so at to avoid the ancessity of transfering the
goods an object is to provide improvements in
table trucks as claimed in Passes 1 140,000
greated to the same inventor.

WALKING ATTAGMENT FOR MOTOR WALKING ATTAGMENT FOR MOTOR VEHICLE—O E Immon Reselver Afheria. Casada The invention has he he object to provide a device for attackment te motor vehicles anche as we used to carry heavy leads or to create the such as are used to carry heavy leads or to the trailers over rough roads or accessive grades in the vehicle and he load without great less of power. The attachment consists of two similar sections one of which is adapted for attachment to each end of the rear sate of a vehicle COMBINED ELDW-OFF AND HOSE CONTROLLED TOWN THE ALEND TOWN THE AND THE STATE OF THE STA

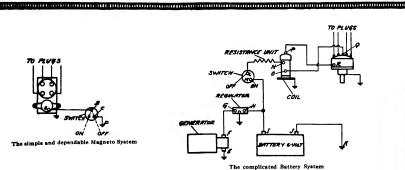
to automatic blow-offs as adapted particularly for permanent connection with tubes isseling from compressed air tanks or pumps for application to tires in garages or analogous places the device is of such a nature as to be automatically dis-connected from the container when the desired degree of pressure is attained in the tire

AUXILIABY HOOD FOR AUTOMOBILE ENGINES—3 T Ears Norwood La Annae, the principal objects which the invention has in view are to provide means for protecting the ageins of an automobile and parts connected therewith from rais and more to provide means for reserving the radiation of heat from an automobile engine, and so construct and arranges the hood so that the same may be acquired and applied as an accountry. AUXILIARY HOOD FOR AUTOMOBILE

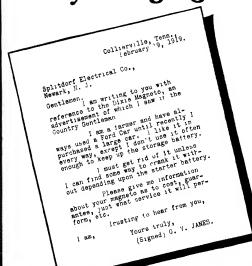
MAGNETO-COUPLING.—R H Pranca Eugens. Ore The invention relates to as im-pulse coupling adapted for use in connection with pulse coupling adapted for use in connection with a magneto to produce a hot spark as slow segine speed as what the captes is being created, thereby enabling the largest engiant to be started on the magneto without the use of basteries. The device is comparatively simple, and so designed as to be automatic in operation.

# DESIGN FOR A CARRIAGE RATTLE.— L. Mosés, SS W. 88th St., New York, N. T.

We wish to call assention to the fact that we are in a position to resider competent services in every britches of position or under competent services in every britches of position or under make visit of the competent services of the competent shows a position product of the subject applications, transported of the complete nature of the subject-market factorized the positional services of the competent 
MUNEY & CO., Passint Astorneys, 190 Streetmer, New York, N. R. th Other 1808 P Wilson, Walthampton, S.



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program or suggestions, the financier who wants the latest information available as to what the treasury is going to do about any vexed question the business man who wants the latest pronouncement from all the government bureaus which will affect the tile industry the making of pins or pianos or planting peanuts can get it here and get it quickly

The fourth file is a State Activities file. which keeps available and fluid the work

of the individual states
In addition to all this the Research Division has made some surveys of the work of the government which have been u revelation to almost everyone who has at Washington is a mighty engine, inde-It is so vast that many a man who has It is so vast that many a man who has hved a cog in it all his life has no idea of its magnitude. Here probably for the first time have a series of investigations been made which have resulted in charts which spread a working plau of the government before the eyes of him who reads

The first of these charts shows in graphic form the reconstruction activities of eververy war created organization in y vernment such as fuel food and railroad administrations the Council of National Defense itself War Trade War Industries Board, etc and all the related organizations which are extra-governmental such as Red Cross Y M ( A U S Chamber of Commerce lal ir organizations etc. etc. In other words it is a birds-cyc view of all forces working on any phase of reconstruction. The second chart is of the reconstruction.

agencies of the Federal government arranged by agencies Here the larger governmental divisions are subdivided so that, for instance under Agriculture
it finds not only the department and its
a tivities but those of all its bureaus engaged in reconstruction work such as the Office of Farm Management, the Forest Service the Bureau of Highways and the Bureau of Markets Under Department f I abor is found citations of the work of

third chart is concerned with a survey of all the official agencies created or war purposes exclusive of the War and Navy Departments This chart gives the agen's the authority for its creation its fun tions and whether permanent or terminable and if the latter the date

( hart four lists the readjustment activi ties of Federal Agencies arranged by topics so that one can had just what and who is working on demobilizat in and placement what government bureaus are concerned in so til and political welfare work, where to go to get all information relating to foreign and dimestic trade cte

A thing like this has ever before been d me for the government of those who use the governmental machinery. There has sever been strange as it may seem any just what the Federal agencies were at digest of reconstruction news by which er h department and each bureau in each d pertment is kept advised as to what ov re ther department is doing which in ant way affects any reconstruction pro-

Reconstruction in the United States government, between part and mert, and between the public or any member of a moformation of the government's labor and any part of the government machiner, moveram or miscration, the financier who so far as reconstruction is operating when it is better known to the people if can serve, its power for constructive in reconstruction will very evic become immeasurable

May 24, 1919

### The Case for Water Power (Comitmued from page 541)

water power amounts to nothing at all and here the topography is solely response ble the entire settled portion being located in prairie country which possesses; natural water-power sites

Nor is our northern neighbor the oul; one of our contemporaries that has begun to tap the great supply of stored sun-power represented by the water that runs down hill all over the surface of the earth in Great Britain traditional coal-burner proposals have been put forward for vast central station plants, and careful stock United Kingdom Since the outbreak of the war and the divorce of Italy from her previous sources of coal supply, the Italian Government has proceeded with an active water power policy, in 1917 and 1918 con cessions were granted for 1,024,000 horse power Norway has developed 1,120 000 se power, and plans to export current to Denmark Barcelona, in Spain is replacing steam power by hydroelectricity In Switzerland fully a quarter of the two millions of hydro-horse-power available have been developed. All these items are straws showing where the wind blows I hey indicate that other people are laying a better foundation for power for the year to come It is with these peoples that we must compete for the world s trade

# Connecting Staten Island with Manhattan

(Continued fr mt page 545) York (ity An alternative route is shown at B I his calls for a tunnel to I lis at B lating and thence to the Jersey shore, where the tube would rise out of the Bay and the line would be continued by a bridge within the bulkhead line of the Jersey shore to Constable Hook Here a tunnel would the Special Committee on Reorganization of punder the Kill van Auli and ran into the U. S. Employment Service, the Bureau all the advantages of Route A with the All Innugration and the Children's Bureau all the advantages of Route A with the additional advantage of providing for travel out in the open through most of the Both of these plans are proposed by the Staten Island Chamber of Commerce

Route C is a direct tunnel running all the which has been suggested by John I O Rourke

Of course all tunnel schemes are ex pensive particularly when they depend merely upon the traffic provided by Staten Island For this reason Route D has been Island For this reason Route D has been proposed by Gustave Lindenthal, which consists of a tube under the Hudson River to Jursey ( ity and thence a railr Bayonne with a tube under the Kill van Kull at (onstable liook Such a route would provide for taking on passengers at Bavonne and other points and would probably early more traffic than would the direct tunnel route

Route I proposed by S Johannesson is s milar to Route B in that it provides for tunnel connection with Ellis Island and Comrunipaw, but advantage is taken of Ellis island to bring the tube out of water and extend it as a bridge direct to Staten any way afferts any reconstruction pro-trains or policy must be looked upon as all work the value of which cannot be measured in other time or money but whoth which we could individually or officially, proceed at best but slowly and in the dark Created for and functioning expressly to an information is very much at the service tion information is very much at the service of those natividuals, corporations or other interests which need it, either by letter, interests which need it, either by letter, the phoney were or personal microrsew The Research Division is the point of the should be required for large theybone, were or personal microrsew to seel. The by along the Jersey shore contact between both government as a so whole and the functioning of parts of the LEGAL NOTICES

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### INVENTIONS\*

BAVE you a practical invention to sell outright or see on reyalty? Bend details to Adam Fisher Mig 78 St. Louis, Mo

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### FOR SALE

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### POR SALL

PATERT LINEST OR SHIPPIP NEW SHIPP PALES.

In addition to a direct connection with Manhattan, it is proposed by John F O'Rourke that a vehicle tunnel be run to Bay Ridge, as indicated at E This tunnel being practically two miles in length, would neet with the same objection that was brought form against the Hudson ventilation.

I tunnel, namely the difficulty of ventilation.

A novel suggestion has been proposed to overcome the visitlating problem. Vehicles would not pass through the tube under their own power. Instead there would be described to the control of the con direct lines of railroad through the tube on which trains of flat cars would be run These trams would be electrically propelled and on the flat cars the vehicles would be carried This would provide uniform rapid transit for all classes of vehicles, and there would be no possenous fumes liberated in

We shall not attempt to pass upon the relative merits of these various plans, but it is clearly evident that something must be done and done soon, to connect States. Island more closely with the city

### Better Packages and How to Know Them

(Continued from page 546) the nails The wood may split or break across the grain

Any one of the numerous weaknesse of packing box construction may be de-veloped in this test until finally the of server is able to build up a box that is practically equally strong in every feature Boxes are then built packed, and tested until the presence of this balance in design is clearly demonstrated. Such a demon stration will show failures ultimately or curring in average proportion in naile pulling from the wood, wood pulling from the nails splitting or breaking of ends sides, tops or bottoms and through the

# Accelerated Tests for Overseas Shipping Containers

The special box testing machine the borest Products Laboratory at Made son, Wis have been of considerable service during the war Specifications prepared largely in the U Second Service were adopted by the Central Staff for the entire War Department These specifications allow the use of all species of wood suit able for boxes and crates and require able for boxes and craces and required different thicknesses of material, spacing and size of nails etc. depending on the requirements of use. These general specifications have reduced costs very materially mcressed the sources of supply, and opened the field to package manufacturers generally

About 20 types of boxes have been re-designed for the Ordnance Department of the Army and other bureaus and services the Army and other pureaus and services. The Ordinance Department reports that the Service recommended immense value—the boxes recommended have generally proven cheaper than the original designs owing to the use of a large number of species rather than white pre-aione and the use of standard types of construction and standard thinknesses of

### Saving in Space in Overseas Ships

The boxes recommended have generally been of considerably has displacement than been of considerably less displacement then original designs, and the money value of the shipping space saved has been a viry-large item. As specific xxamples, are specifications for ordnance equipment boxes made possible the use of about '30' species rather than high-grade white pan-done, admitted thinner material, and saved cargo space. These boxes were displiced by the million. Here was a supper by on minion 111678 was a distinct space saving in grenade boxes through redesign and slipments were made by thousands. A redesign of a box to carry 30 one-pound cans of saddle soap carry 30 one-pound cam of sacare seeps awed 43 per cent in cargo space. A box designed to carry 140 pounds of cannon powder was redesigned and effected a saving of 14 per cent in cargo space. A box designed to carry two Browning automatic machine rifles with equipment



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DURAND was redesigned with a saving of 28 per seat, both in carge space and material. A box designed to hold 10 U 8 1917 model designed to hold 10 U 8 1917 model was redesigned and 33 per cent of carvo space saved ox saved more than two cu ft per

Official reports from France say that since the first of July broken packages since the first of July broken packages received are only 15 per cent of prior losses and now compare favorably with domestic shipments. This is in part due to the application of the results furnished by I orest Service

Recommendations by Service experts on waterproof case lung paper were adopted by the Ordnance Department of the Army for all packing hoxes containing pe and horse equipment and tools and are reported to have proven very satisfactory

Larest Service recommendations con erning the water proofing of labels wer adopted by the Ordnance Department of the Army with satisfactory results, and later were approved by the General Staff for the War Department

For the War Department Various instellaneous investigations index on strapping seals patent boxes, and to not strapping seals patent boxes, are reported by the Ordnauc Department of the Space is Valuable! of standard specifications, insuring material of season and various deposition of season and various deposition of season and various deposition.

### The Cockpit of the Transatiantic Seaplanes

(Continued from page 51")

as the compass was an indication, and actually be moving on a course diverging considerably from the true course. drift indicator works in cooperation with some fixed mark upon the surface of the water and to provide such a mark the navigator carries bombs which are dropped and ignite upon striking the water giving forth for several minutes a dense smoke and a bright light—If the ship is being driven This is but one instance selected from many by the wind say to the south of her course, the object on the water will appear to move north across the vessels course and vice versa. By means of the drift indicator, the amount of this movement in a given tim recorded Since the navigator knows his own elevation above the water and his own speed he is able to calculate the speed and course of the wind A simple calculation will now tell him how much he must head up into the wind to insintain his you

> In the event of dense fog interfering with the use of the drift indicator, the navigator the use of the drift indicator, the navigator will be assusted by his radio compass which, if all goes well will give him warn-ing, if he begins to diverge from his course. The two little cylinders which will be noticed in our photograph attached to the

mon its true course

bow of the b nat an two very powerful in night landing When in flares for use in night landing nares for use in high landing when in use, they are drawn down by elastic cords so as to project disgonally towards the point of landing they are ignited electricelly and throw a strong illumination upon a considerable area of the water below

### A Megaphone of Novel Design

(Continued from page 548)

placed at the small end of the megaphone bounds in the air, such as that of an air-plant may be located by this method The megaphone is held with the major axis of the aperture horizontal and then moved around in a horizontal and then moved around in a horizontal circle until the air-plant sound is heard. This locates it in a vertical meridian. The mogaphone is then turned with major axis vertical and moved on the vortical meridian until the sound is again a maximum when it will be found to point directly at the airplane.

This may be done with the eyes shut and more quickly than it takes to tell it

The form of sperture need not be ctangular An elliptical aperture walk bring the same result , the essential condition being that one axis is greater than the other and both proportioned for maxione other and noth proportioned for maximum effect to the average wave length of sound. It is applicable for music as well as speaking.

# Heating Water by Means of Electrolysis

(Continued from page 552)

Cylinders fitted made one another, are here used instead of plates. In order to make it as compact as possible the cylinders ace placed very close together, being separated by 4 mch. The can is something like a coffee put being 10 mobes high and an inches dam. The three plug connections D I F are for the three phases. The cold water passes first into the in portion of the can and then flows into the spaces between the cylinders, and so reaches the mouth G. It can be hung on any water tap. The temperature can be any water tap. The temperature can regulated by cutting out one of the phase exactly as in the other type. Tests he shown that 25 amperes at 220 volts w boil one gallon of water According to the speed at which the water passes through the can its temperature will be warm or

### Recent Patent Decisions

Will RI a defendant sold an infringing VV washing motor, and the ordinary sales unit consisted of the tub fixtures, and infringing motor held that the profits from the sile of fixtures could be recovered only not from the fixtures were useful solely it connection with the style of motor infringed and complainant could not recover prints on that part of the hatures which suld be used in connection with other styles of motors. An infringer, accounting for profits, is entitled to credit ing art cle Where the infringement was deliberate all doubts as to profits should be resolved against the infringer -Coffield Motor Busher Co v Wayne Mfg Co, U S CCA / W)

In the patent for an invention to treat the hum in body by confining and applying electric light and electric heat by means of an enveloping chamber the record discloses a former patent assued to one Gohim m 1900 It shows that Gohim conceived the idea of applying heat and light generated by electricity to the body below the shoulders. He used two struc-tures on a mounted on a standard and wheeled up on either side of the bed of table on which the patient rested. From these supporting standards curved partiproje ted inwardly and formed a top, and stantially the length of the human body Curtum were thin drawn at the end of each damber and the electricity turned on Iwo and a half years after the issuas of this patent the patent in suit was applied or It is quite manifest that when the patent in suit was applied for the applicant was tinsware of what Gohlin had done or on his patent and realized his own improvement. Then he filed a new application properly discribing what he brought into the art. This was a simple coastly movable, readily adjustable apparatus withoutstand-ards or support. It was adapted to take such different forms that it could be used on any lunb or part of the body, and thus oreate a hamber which could in size and shape bring its walls into closer relation to the memler to be affected by its radiated heat and light He dispensed with stand-ards by suspending his simple apparatus by coling cords. This allowed it to be by coling cords. This allowed it to be swung about and to be placed in any posi-tion desired. It could be picked up by a handle. He used a hinge which allowed the sides t be adjusted and wrapped about the heated part. Held that the patent is entitled to a construction broad enough to protect the valuable contribution of the patentics to the art -Edmands v Periman

The wardrobe trunk was produced by Seward at first, and had in combination a gate hanger pivotally mounted within the over portion, brackets extending laterally from said gate hanger, and garment hangers having a two-pointed suspension mounted upon said bracket As soon as

loads, thoroughly essaoned partecity grained wood; exactness of grading, always, in every individual penali make the far-famed VENUS Penolis Perfection for magnable persons of the perfection for magnable persons and persons perfection for magnable persons for m





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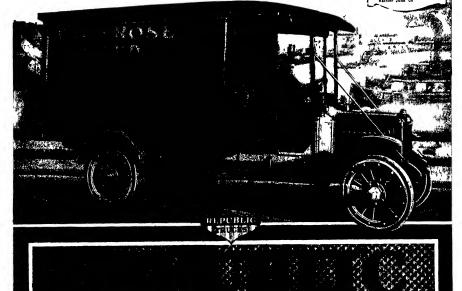
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### Recent Patent Decisions (Continued from page 550)

irds was an original conception every dement of which cooperating in a new vorking way, made Seward a trunk a success Farher trunks were failures success Farher trunks were failures Seward gave the public sourching work-able and novel and the public put its seal of approval on his work and the court sustains the validity of the patent - Rauch bach-Goldsmith Co + Seward Trunk & Bug

The invention relating to the commercial construction of sound records in having for its object the production of a number vided with extra fuel tanks for the great for its object the production of a business years and extra our cause has been given of copies of an original reord of a graphs—flight, but nothing official has been given whose, consists in cutting or engraving out about the matter. It would seem that of copies of an original rivord of a krapine-flight, but inclining official has been given phone, consists in cutting or curriving out about the matter. It would sent that upon a tablet of autable material by means the average speed maintained on the first of the lateral vibrations of a stylus a log of the flight taking into consoleration record groove of uniform depth and having the favouable winds, was not as gratalistent undulations corresponding to the last might be flied the first statement of the second wave next conting the same with a lews that the goodine capacity has been sound wave next colours we same win a lews that the gasoline capacity has been cotting material, then forming a matrix thereon by electrolosis and finally separation in the property of a matter of the same and the British lebs instead of the shorter a tablet of suitable material. Suit for Newfoundland Anoise route to be taken The claims of the part needs by the scaplans broation and it is continued. One navel feature of the rallo installa infringement combination and it is continued are for a combination and it is continued on behalf of the invintion above described on behalf of the invintion above described and the control of the contr Itingation and was adjudged valid in which can I used for telephone and Amorican Craphaphone to v Universal by decruyers and other ships Talking Machine Mfg. to and same v The electron installation of the C.

introvements in the ctro-me hantal water wheel governors. In his specifications the inventor sets forth that governors used to regulate the water supply to the water wheel in general operate only topen or close the water wheel gate, thereby supply of water. The first effect of such TV RROMOTYBDI NUM is added to opening or closing of the gate coming to the steel as a fixed addition. opining or closing of the gart owing to the a sixed instruction of the water, as always the opposite, increase in a consistent of the which it is desired to bring about, cording it is to momentarily cause less velocity in properties to momentarily cause less velocity in properties water at the wheel, owing to the grant orbit the water has to flow from much and, vice verses, the closing of the gate where the properties of t nting to momentarily cause an increase of velocity, owing to the contraction of the orifice. To overcome these opposite effects, orfice. To overcome these opposite offects, ever it gives these projective only while the patenter provides a by-pass inserted addition is properly made and proper heat into the flume at a point near the water treatment follows. The guilation of these pass and sign in the by-pass controlled, lactors caused so much trouble and expense by the same governing mechanism that that, in the United States, the manufactorities of the same for which provides the pass according as the water gate in being years to it used for this purpose in other closed or opened. Other principal features countries, however, to a considerable excitate to means for preventing excessive ties! At the present time it is mainly action of the governor and to control of the employed in tool steel as an auxiliary rather governor by a dyname driven by the water than as a major constituent Various wheel patent these prevailed in the art an jointimum of the use of morphodeaum oriflon wheel Appealant otherwise in the art an continuance of the use of molybdeaum absolute want of sensitive speed gove ang Taylor found that molybdeaum in rapid and that there were fluctuations occurring in the supply of electrical energy produced by any generating unt. Obviously one-had seemingly the same treatment, gave extent speed in decuse of power from a water. If any ownations on their maximum outling wheel is desirable, and inventors have speed. One manufacturer has stated that scught to maintain an equilibrium between the inputs erack in forging, the tools crack the power of the water projected upon the on quenching and molybdenum appears to buckets or backets of the water wheel and youldlike from the steal whee heated

mechanical power being taken from the water wheel There never before has been a water wheel governor constructed in eward disclosed it, his truns and tuns of the personnel of the first disclosed the part of the personnel of the part of the pa infringed Held not infringed - Henry (
tity of Los Angele | \ ( \ 1 \ f \ ( al )

### Our Trans-Atlantic Dirigible Fntry (Continued it main 49

favorable ands Under the most favorable conditions the dirigible can re-main aloft some 70 hours at a speed of some 30 miles an hour the engines in this case being run singly and alternately so as to economize fuel

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### Use of Molybdenum in Making Steel

steel as a fixed addition, nearly all the molybdomm remaining in the steel, ac-cording to a prominent American metal-lurgist. It is supposed to give the steel properties similar to those of tungsten steel, but only one third to one half as much molybdenum is necessary that is where regular high-speed steel contain 18 per cent tungsten 6 to 9 per ce molybdinum may be substituted. How steel caused irregular performance, that steels of the same composition, and having



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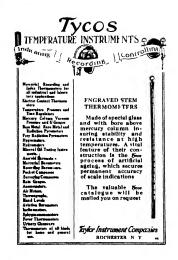
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of terror, has consented to tell the story of Bolshevist Russia to the American people through the pages of the Metropolitan Magazine

Raymond Robins went to Russia for the Red Cross in the early days of Kerensky. His appointment was the result of Colonel Roosevelt's earnest plea

Roosevelt knew his man Robins' job was to feed starving women, and children When Kerensky fell and Lenin and Trotsky rode into power it was still Robins' job to feed those who hungered. It was no time for

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capable Lenin, planning behind his slits of eyes a world in revolt These two men Robins saw on an average of three times a week for more than five months He learned their philosophy from their own lips.

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BOLSHEVISM is a fact. The supposed in this was a top the supposed in the supposed possible in the supposed in the suppose 
The days of ignoring it, of save improve upon the original edition just calling it hard names are past. Now we must face it, recognize it, understand it.

The American who knows Bolshevism, who is interested to be supported by the save in the face of the save in the sav

ibe Shiper index Industry By Roy Wilmarth Kelly and Frederick J Allen Introduction by Charles M Schwab New York and Bonton Houghton Mifflin Company 1918 8vo 308 pj. illustrated

It was a question of building ships faster than it. I losts could ship them—and we did it. How we did it is tood in the official and authoritative, book wertten with the assistance of the ship ing toach. It shows a wast highly intricate a ship ing toach. It shows a wast highly intricate a translate reproductions depit the parts layed by the wards in true due in hundred shape; if we rambide reproductions depit the parts layed by the wards in true due the stephy steph duction of a slip. How are views of yards and titles of the ship in the stephy steph in the ship in the ship is was a question of building ships faster than

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y point the tast ayes needs explained and in a human or that he can turn at once to the explaination without wating through a mass of suppliable material. It first familiarizes him til the Act by means of a careful digest this is a savere many of the less twolved questions in a clus. The full care of the Act of the calleges. restree of this remarkable story. It is dramatic, thrilling restree of adventure among the shifting and turbulent scenes an uprising of one hundred and eighty millions of people.

Through the story stalks the voluble Trotsky and the shrewd, able Lenin, planning behind his slits of eyes a world in revolt ease two men Robins saw on an average of three times a week in the slits of eyes a world in revolt ease two men Robins saw on an average of three times as well as a well with the slits of eyes a world in revolt ease two men Robins saw on an average of three times as well as the slit of the same of the slits in the same and 
nature of gravity and moments of inertia ad is a very therough especialism of sign has suitable as may be required in structural actions design and sugmenting practice ovelops all considerations logically and some problems. Oraphical methods, bottle of solution of complete methods and the representation of results, are for supplied and the theories precessed are boiled in a generous assortment of problems. The text was primarily designed for students; the Departments of Engineering in the Macs echastet inclusion of Technology

chusets institute of Technology

STUDIES is ELECTURE PER 1200.007 (Ani. 1
and Vegetable). By Arthur E. Bau;
New York E. P. Dutton and Co. 1918

New York E. P. Dutton and Co. 1918

These reservines present a new view of a operation forces of the litting organisms and from the authors denovery while scholatest, in Delapas Bay that the slockfed current is come body disturbed the seatings of assistanceder. The work records seem entire in the come body disturbed the seatings of assistanceder. The work records seem and according to the common of th interesting experiments in support of the electric structure and function of plant life and proces to electro-physiology the nature of the na-impulse cell reproduction unipolar and helpol-cells the organs of sense one with an interpret-tion of electrophysiological phonomens. It is, provocative work tabst sessue likely to open it done to a new and fruitful conception of the par-played by electricity in the human contours.

payed by octificity in the homan common THE BRITTH NATY IN BATTLE BY Arthur H Pollen Garden City N 1 Doubledey 1 Page and Company, 191 Whitehall had buildered. With a navy win-very tradition passed it to offensive action Whitehall had buildered. With a navy win-very tradition passed it to offensive action Whitehall long induced upon timeocous—because unimaginately and disconsist—causion in 111 work by Engisted a great navel support the result of the common statement of the common statement of the common of the common statement of the common statement of the common of the common statement of the common statement of the common of the common statement of the common st of this policy and its reversal are shown in master; its tile of the concenture between German a. British units and finete Pallacide are expose; root decrimes expounded and the elements victory restated all so plainly that the generated is not been applied to the property of the exhaustively analysed; yet these analyses with the characteristic plainty of the property of the prope

cannot be too universally pondered My Lira is by her Hirman S Maxin London Methuen and Co, Ltd Svo 322 pp illustrated in this large clearly printed work the Maintenance of the management of the state the decoration of the Lepton of Homeur has of his inventions are shown in the library actions to be the second of the library actions stages. His flying matine experiments are recorded his success with smokeless powder and many other achievements. It is the interesting such or information among autobiography of a chroni inventor.

THE STARREST DATA BOOK FOR MACHINISMS Vol II of the Starrest Books Athol Mass The L S Starrest Company 1918 12mo 179 pp, illustrated This presentation of shop practice and the pany 1918. Izmo 179 pp, illustrated 71he presentation of shop precision and the materials of manufacture is almost entirely in tabular form a Pamiliarity with mechines and tools is taken for greated is thus supplements Vol 1 which locate with the how and why of portations and procedures. As a work of refer possible to pack the own of the restriction makes it is not appeared to the control of t

STUDIES IN ELECTRO-PATHOLOGY By A White Robertson, LRCP and SI New York L P Dutton and Co 1918 8vo, 304 pp illustrated

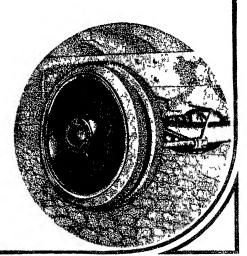
The author traces disease to a distrubbanc equilibrium in the obsences and electrical section of the cell and cammines such curative medi-as promise a restoration of normal conditi-Among other eagentive distrusions are show the physicionical artists of light elect-Artisto Mochanica Vol. II Straught electrical tradicional article of light detected of Matornala By Charles E. Fuller electrical tradicional in the metion on a S B and William A Johnston, S II S New York John Willey and Sons, 1919 results The bast past of the voltime for the work of S0 pp. Illustrated to the work with a knowledge of calculus states and dynamics.



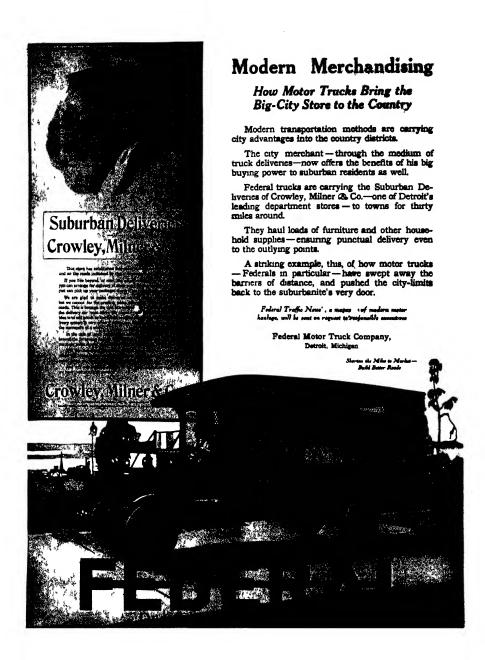
The strength and power of Clark Axles is apparent in every line of their design.

Clark Disc Steel Wheels please the eye of the customer and the mind of the engineer.

Clark Equipment Company
Buchanan — Michigan



Clark Equipment is found only on good motor trucks



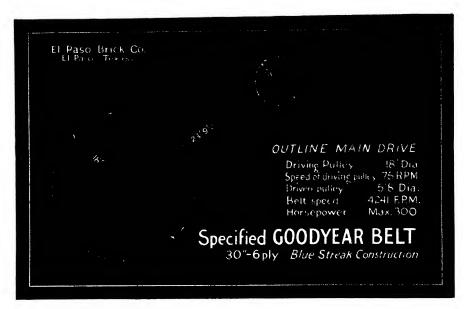
# SCIENTIFIC AMERICAN



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Published Weekly by

Priso 19 Conts



# Wasted Horsepower—and the G. T. M.

It was a spendthrift of power and a trouble maker of the first class, that main-drive in the El Paso Brick Company plant. Some years ago it was all right, but as the company grow it got worse and worse. Every kind and many grades of belt were tried on it. They slipped and jumped and stretched. They wasted horsepower-hours by the hundred. Most of them lasted only four or six months. The most expensive ran their unreliable way for about a year. They made that main-drive one of the most costly things in the plant. Finally the manager, Mr. Rodgers, saked a G. T. M.—Goodyear Technical Man—to call.

The G.T. M.—our Mr. Wetson—was told by Mr. Rodgers that it was planned to try out an 18-inch 8-ply Goodyear Belt of Blue Streak construction, but that it would be a good thing to look over the drive first. The G. T. M. thought it would be a good thing to study the drive—so they went and looked and measured.

There was 300 horsepower coming off a fly wheel with a 40-inch face and intended for delivery to a shaft-pulley with an 18-inch face. But 105 of the 300 were being wasted by allippage, because that line-shaft pulley-face hadn't grown with the plant. When the plant was young it had been all right, but as production and loads increased, it became much too small.

The G. T. M. recommended to Mr. Rodgere that he put on a line-shaft pulley with a face to take a 30-inch belt, specified a 30-inch belt, plus Circuit and was told to go ahead. He did. When the belt came, the C. T. M. went and bought the proper fasteners himself, just to make sure that

they would be the right size. The belt and the new pulley were installed in April, 1918, and that main-drive has been a joy ever since.

From the first more than 100 of the 106 hersepower formerly wasted has been saved. The belt runs with perfect amouthness and evenness even under the heaviest overloads. It hasn't needed attention once. And it costs much less than those that used to slip, stretch and break under overload, and waste a thousand horse-power hours in an ordinary working day. And the Goodysers Belt specified by the C. T. M. is in Mr. Rodgers judgment good for several more years.

There are many main-drives for which a C. T. M. can do similar things—main-drives still belted according to precedent instead of in accordance with the real conditions. Not all of them have outgrown pulley-faces, but many have; and acores of others are using belts of the wrong construction, others have belts made of materials that require such extraordinary lightening that they are hard on bearings, cause shafting to weave, and waste power and time in many other ways.

Ash a G. T. M. to look over your mein-drive. He will call when next he is in your vicinity. He may find it all right—and if it is, he will tell you so. If it isn't, and he recommends certain changes, you are in no way obligated to carry them out unless his reasons convince you. And bear in mind that the main-drive is the most neglected, taken-for-granted, precedent-burdened drive in three plants out of every four.

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO





# Every community should have roads like these-

a g a d of fleet of the liberty T uch,
past hog Dak lie De auwer,
(o s l i 4 gust 1918 over
a R a i 1918 Kute per
e n of oad af er two years

LERE is the story of how Delaware County, Indiana, got good roads, as told by the County Surveyor Every one interested in good roads should read it

'Our first Tarvia road was built in 1914 Be tween 1914 and 1918 we constructed sixteen streets and roads with a total area of about 2880 000 square feet

Some of these are main streets in the city of Muncie others are main roads subject to heavy traffic while others replaced low lying gravel roads that used to wash out at every overflow of the river Freny Parvia road and treet in Delaware County has given uniform satisfation. No re pairs have been necessary

Our so called hard roads built of bink of concrete are often damed as permanent cen structure but we have in this and but ke has and attreets built less than a decade ago that are almost impassable and must soon be rebuilt New material will be required because the old brick cannot be used again.

On the other hand when a larva road wears a little stone is added Tirrua is applied and the road is as good as or better than new

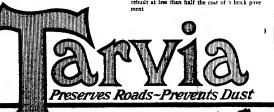
With proper maintenance in Tarvia reads will last ten to twenty years. The cost of mun tenance will be small and the entire road can be rebuilt at less than half the cost of a brick pave

Considering the virtus types of 194d from a purely from I standp nt one discount need to be skilled in higher mathematics to arrive at the orrest inswer.

(Signed) S. Horace Weber, County Surveyor

Invia is a coal tar preparation for use in constructing new micadam rouds or repairing old ones. It rein forces the road surface and makes it not only mudless and dustless but also water proof. A few Tarvia Roads in any community will add to property values and reduce taxes.

Illustrated Tareta Booklet free on request



### Special Service Department

In order to bring the ficts bef e lax payers as well as road authorites. The Barreti Company has organized a Special Service Department which keeps up to the minute on all r ad problems.

problems

If you will write to the nearest office regard 1 g road conditions or p blems in your vein by the matter will have the prompt attention of experi

matter will nave the jump attention of easy tended engineers.

This service is free for the asking If you want letter to it and lower taxe this Department can greatly use st you



ESTABLISHED in 1905
the Diamond T Motor Car
Co began exclusive truck manufacture in 1911 so that their
1919 model is a product with a
pedagree Fourteen years continuous successful manufacture
safeguards the Diamond T
burkhave!

Section was considered to the complemental and the control of the



# How Much Will It Cost?—

# DIAMOND T

NOT to buy—to run Per mile, per trip per ton, per season. Owners' records give definite answers

Charles Blanket's two-tonner, at Coney Island, cost him \$2.20 for repairs during eighteen months' service. The Peter Schoenhofen Brewing Co. says one of their Diamond T two-tonners "has been in service almost two years, and our operating records show same to be the most economical of the nine makes we have operated."

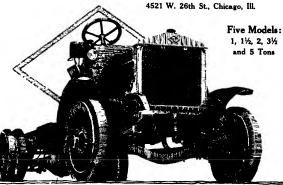
Tonawanda Brewing Co. says their Diamond T holds the records for the lowest cost of upkeep of any truck in Eric County "Hasselbeck Cheese Co., Buffalo add "For continuous work without repairs we know of none that equal the Diamond T  $^{\prime}$ 

Facts, not claims—the only justification for your purchase.

The reasons for the justifications are mechanical in the truck. They are familiar to engineers, but are seldom heard from by the owner. The unique Diamond T Spring Box the perfected Hotchhaiss Drive adopted by the Government for its Standard Military "Class B" Model, the special Driveshaft Bearing Carriers, the Overhead Worm Drive, the all Chrome-Vanadum-Steel Springs are typical of Diamond Ts roadproof makeup

Have you read those fascinating booklets "The Famous Drive That Came From a Pamous Gun," and "This Early Bird Got the Worm" and "Across the Road From Success? And have you a copy of the "Datalog?" Write for them They shed some light on what it will cost you not to enjoy the operating economies of Diamond T, "The Nation s Freight Car."

# Diamond T Motor Car Company



and a bit also a time about 15 - but be every to the first and confidence and con

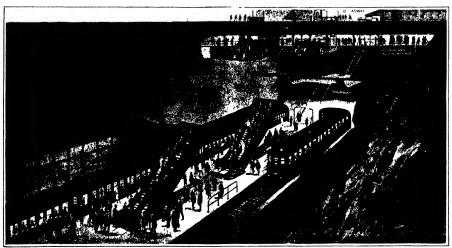
# SCIENTIFIC AMERICAN

### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX

NEW YORK, MAY 31 1919

\$5.00 A YEAR



The deep subway station at Park Place, New York, showing the escalator system as it will appear when completed

### The Park Place Subway Station Escalators

This Seventh Accini subway coming down the week and of the New York, or turne east at Park Place passing under the Past Office and on to William, where it turns downtown again and extratillar rine under the Last River to Brookkin. In the course across town it must are under two existing subways namely the Brookkin Rapid Trainet Subway which runs under the Brookkin Rapid Trainet Subway which runs under thought at the point and the old Interbenough Subway which passes under Park Row. The simulate it in recessive of the subway at Park Row to down the total passes of the Park Row at Park Row to down the total the Park Place station have a long climb from the station platform to the street. This actual vertical distance as \$8.52 feet. In other words it is a thrice story climb, a brathless undertaking for many persons.

undertaking for many persons
When the station was plaused, provision was made for
a pair of establists to carry pass mere to and from the
relation platform of the state of the state of the state
and platform of the the halo of type of collaboration were
relation platform in the the halo of type of collaboration when
the state of the state of the state of the state of the collaboration which would seconmodate three persons
abread on seach stip. It was thought advansible, however, to use narrower escalators than these, so that four
of them could be installed. The purpose of this was to
provide greater flexibility of operation for each could
be driven separately and a design was shown which
would permit of n versing the escalators so that, if demarkle, the majority of them could be operated to earry
passengors upward in the worning rush hours and downward in the evening rush hours in klawses adapted to

handling crowds on special occasions.

There are two well-known types of escalator in common use, one known as the step type and the other the cleat

type. In the step type, the steps are arranged to run out on the same plane at the eq and bottom of the secondator so as to form platforms. It can from not entrance to the escalator. The possingers step upon these platforms from the sit and in leving the ces into there is a diagonal shaut which would naturally guile to posseniger to the odd of the platform. We have been seen to the coral ton it is not advisable to have the passening rest of the end of the nowing platform owing to the diagor.

impung. Where the clear type of excellator is mostalled, entrance to and exist from the conclutor is made dure the state of the excellator is made dure the state of the excellator is made dure the state of the excellator is made and the extended of the traveling clear's fift on any reason to should not step of the excellator in the fiftee standard of the excellent of the property of the excellent of the extended of the excellent of the extended of the excellent of

plates with the teeth of the combs projecting between the charts of the steps so that they will automate ally but the passengers leet of the st-p upon the fixed platform

The ses daton who has now being installed and may be in server by the first threat the published has a capacity of 5000 pressing reperhour and it rises at an angle of 0 diagrees, numing at the rate of 90 feet permitted Long experience has proved that a higher rate than this is agit to cause injury, to critical species with the season injury, to the season properties which the season injury to the season provided from the simple season injury to the season provided from the simple season injury to the most than one person of our occupy, a step at a sangle time. Fich step is really a platform on which in passinger can stand and this is the risaon that it is so much deeper than the ordinary to distarways step. A 22-horse power lecture motion is used to operate the scallour which it does through a worm pair. An international contribution of the provided in the standard motion steps remaining under those of by the truming on of the motion. The osciolator rises 28 feet from the station platform to the measurament of the measurements.

At present to the conditions at the Park Place subsets station are such that a single condator will more than vectumodelt all the passingers travelling in a single direction. Two cealators will be ample for all the traffic for many venue to come but looking into the fature provision has been under for four ceal triers, and our artest in the accompanying organizations has given use a plet equipment is modalful. The hand starway is, which provide the only means of ingress and gross at present, are shown in plantation in the engraving.

## SCIENTIFIC AMERICAN

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New York, Saturday, May 31, 1919 Muna & Co. 233 Brandway, New York

The short of this journed set of it was telly and lives lighthe threat a tentify no chim of and undustrial measure of the lay has northly journed at as in a poortion to an name or this atong deads provide legiste they are published elect.

The Fdst 1 saylet | how submitted to him timely as les autorile | line columns caperally when such articles use it my city ph t g apha

### To the Mayor of New York

I the mayor of this city should have or make or ase a to walk a ross the Bracklya Bridge by unmertakable evalence that this great structure or suffer ing from a neglect which shortens its life and if it extends to the whole bredge may well it threatening eta sefety We refer to the pine in the tep churchs of the stiffening trusses adjusing the promesade where any powerby may identify several worn pins by the brost stre ks of rust which surround them and discolor the steel work below So great has been the correspon that some of the joints show a went of as ion h as an eighth of an meh Hem is present by the fact that under the lead of a passing train the nuts which hold the pins in place have a lateral movement of that amount re turning to their normal position when the train has When it is concubered that the assembly of thord evilars and post at a panel point is supposed to receive the pen with a tight ht et clocs not take a bridge engineer to understand that the structure at least in the particular part of it has been subjected to a shocking

A great engineering work nuch as this if it be carefully
and periodically inspected should be as enduring as the
Pyramids but if it be neglected its determination will be
progressive at an ever multiplying rate. However,
question naturally areas as to whether the evidence of
neglect which any passer by may as for himself extends to those parts of the attracture, which are remote
and require special facility and the transit eye of a support for their proper inspection. Indied the city
authorities have only thomselves to thouch if the etheron
of New York and Brooklyn assume that the whole
bridge from anelionings to auchorage is in a similar conoften of weller and discusser.

The Scenarios Assentian has fell a pastendar in trends in the question the care of this attracture since the day in link 1901 when senilar neglect came very near to ensuing the whit filese of the linds to break away senifron the suspenders and man eables and drop into the familiar seniform of the matter was decisiond in our senior of August 3d 1901. The salient firets of these near-dissistanters and follows:

At the center of the bridge t all w for the lateral neaveneest of the trusses under the action of the passing trains and als f temperature changes the suspenders which the truss and floor are loung from the main cubles are pr vil I welle rocker beatings where their lower ends come t with the trusses. Due to neglect these bearings her too hadly rusted. The pins moved with great resistance of at all and the reverse bending stresses thereby thrown on the suspenders which at the conter of the bridge were ashill rods ultimately caused them to break in two leaving the floor at that point without their support. It sagged heavily, being now held up merely by the cantile ver action of the floor beams which fortunately are continuous from side to aide of the bridge. The lossy building stresses thus thrown upon the floor beans were cutarly additional to the load for which they were designed and that they should have saved the saturation as a tribute at once to the

excellence of the material and the forbearance of a kindly Providence

Luckily the sag of the roads of happened to be noticed by a bridge policeman. We say 'luckily for had a few clossly-bunched rolls or any thore was no spating of cars in those days) with a bary dray or two to say inching of an slevated train possed amunifaceously on to that part of the roadwax it whole floor of the bridge would have commenced: 1 132 sway from the suppond in which accumulative as (1) in

And what is the condition of it is moker joints today? We recome they are regularly suspected but the millions of citizens who make use if his structure would like t first assured that the negl t which as would on the promen said does not extend to the bridge as whole

the premented does not extend to the Proofs as a wone.

We have no wash to play the droot. In Brooklyn
Bridge as perfectly well able to try its present load
provided always provided that the city offstale are
giving it the close imposition also hevery great bridge
should have. Particularly us it try. I as mammels are
turn out has behat desenably if a cettle per sol safety.

### Boy Scout Week

OW many of us have it justely usualized the increment which was added to our great manufactured of the Boy Results of it was pears through the inferies of the Boy Results of it was we all are aquanted with the existence wid or no rikes with the same of this admirable organization but are we not medicated to passe over its perturement when it a dur-mend of relative askinoidely one?

When the Nation called the it a wouls then 300 000 strong responded because they were prepared In the tret four Laborty Loan compaigns acting for the most part as gleaners after the 1 p rs the, sold 1,967,-047 bonds amounting to \$270.714.650 Fhey placed War Savings Stamps in excess f \$50 000 000 in ated 5 200 carloads of stan line, walnut and collecte over 100 carloads of fruit and nut | its | 1 bey distributed over 50 1100 000 pieces of Gover ment literature. They conducted war gardens and was firms throughout the country | They rendered all serie of invaluable services to the Red Cross the United War Work Committee, the American library Associate 1 and various other organisations that were serving the Covernment They Lovernment which are not recordable under any particular ilassification They presented a united front patrictic scal in every community which in itself was of incalculable value to the nation

Not alone to the boys who del these things is credit due. To the bundred thousand men who have acted as secutinaters, committeened ouncel members and officials only 250 of whom are paid the revibering continuous continuous and the revibering their efforts which is involved in recognition of the Boy Roule as a real force in the community the state and the nation. It is for this reason that hastoonal it issues committee, under the Chancinathy of expressing McAdoo leas been formed for the purpose of expressing the nations appreciation of what the Boy Recut and America did during the war. This expression will take form of a nation-wide Bry-Yeutt Wack from June Rith to 14th. It will sam, among other things to foom the attention of the publis on what the Boy Sout movement really stands for, the immesse part it played in the war, and what it is expected to do in the future.

I stemally, perhaps, the promunest feature will be the effort to get into the Boy Sevite every boy whe will benefit by the associations who he they follow him and the sideals they held out for him who he mean every boy in America. But for the thoughtful citizen the Boy boult will mean far more than this. It will mean closer contact with the agencies which have taken the vast rear your of boy power, so often turned to muchaevous ends and diverted it into thunts where it is of termendous heanfit allies to the boy and to the rest of us. The is what he Boy Sevota stand for

### Further Light on the Shipping Situation

I h our cause of May 17th 1919 we referred to the views of an experienced shipoware and operator, Mr Robert Dollar, on the shipping attuation, and subsequently our attention has been directed by Mr Hurley, Chairman of the Shipping Roard, to a raview of the sphysic by another will-known argert, Mr J H.

Rossetor, director of the Division of Operations of the Shipping Board Inasmuch as this is based upon 30 years of practical experience, we take pleasure in laying a digest of Mr Rossetor statement before our residen

We are remarded in the first place that the amount of vagos paid is to be properly measured by accomplishment and the authority believes it would be a mintain to reduce either the wages, qualify of food, or the number of officers and men employed on American shape, suce has experience has proved that the more efficient service reduced in well surch the higher pay and better treatment. He admirst that we are subject to unaccession. Contact in the form of tonage measurements a matter which should be immodiately adjusted.

The above, however, are not the really unportant tenus Upen the Great Lakes we have, ready to hand, an example of the possible low root of water-house commerce Hare we find that American-built and American-manned ships are headling and carrying earge at the lowest cost per four in the world s commerce If, under the spur of ancounty, we have accomplished this realit made for feart Lakes we surely, by suminar methods applied in a broad-mined way may expect to achieve reommensurate results in despense traffic Mr. Rosseler state is that the higher cost of manning has been exagented anner in his experience it amounts to less than 2 per cent of the total operating expenses. This is far higher Mr. Rosseler shallow Mr. Robert Dollers estimate, but Mr. Rosseler hillow r has the many case, the higher cost can be more than offert by increasing the speed of our ships and breaging our equipment for loading and discharging up to date. Another advantage over our competitors whiph is

fundamental and permanent is the vast supply of oil fuel which is available for our merchant murine. He states that with the ordinary reciprocating engines one third greater distance can be steamed with a ton of oil than with a ton of coal, and the great majority of our competitors are using, and for a long time to come will use eoal. Not only is greater distance made, but it is done with a very considerable reduction in the boslerroom force The numerous 'black squad will gave way to a few men who will exchange the shoval for the valves of the oil burners. Other questions which must be fared and for which an adequate solution must be found if our new merchant fleets are to enter into mecentul world competition, are first, improved types of ships and reduced costs due to American methods of labor saving in which we should be able ultimately to lead the world becondly the coordination of our -an absolutely need railway and steamship linesreform if we are to reduce the total cost of transportation from inland manufacturer to foreign consumer the development of efficient maritims organizations, not only at home, but m all the foreign ports of the world, for here is one of the foundation stones without which no successful foreign commerce can be built up. Fourth, shipowners and merchants must be assured of the lower possible rates of marine insurance at least in the earliest days of this great venture Fifth, it is also nece that favorable facilities be provided for foreign exchan and decounts Lastly, and we commend the feature particularly to the careful consideration and speedy action of Congress, such conservation measures should be authorised as will assure for our great merchant fleet an adequate supply of oil fuel

Before the war, as we have frequently potated out and afforces of a large merchant marans, it was estimated that some three hundred million dollars per year was upon forces abign for earnying its forcing tended in the immediate feature, because of the universal inseress of trade and for our ability to earny not only our own exports and imports, but a fair share of the world's common, we believe that Mr. Rossets's estimated of microsand revenue of over five bundred million dollars per year is not accessive.

per year is not excessive of the present era of checquered history of United States shapping is that great marriams metaphor of Shakespacer "The is a tide in the affairs of men which than at the fixed, leads on to fortune" The United States stands face to face with a great opportunity, never before presented and never in all probability, to come our way again. Them is a call for farmering legislation by Congress.

### Engineering

The Lumber Production in 1918, according to tables recently published by the U 8 broats Service, above a total of \$2,700,000 feet 1 the production for 1917 was \$6,000,000,000 feet, so that the past year shows a considerable decrease in lumber production, this was meet marked in the southern and castern states

The Docks at Falmouth—In a recent issue of the Scientrizo Austria, value docks at Falmouth the final plans show that provision will have be made for 40,000 fest of deep-water whares with a depth of 44 fest alongade at low water, and there will be an 1,100-foot sty dock. At first only about one south of the docks will be built but it is possible that British Ooverments will show sufficient interest in these docks to have the centre 40 000 fest constructed amendiately. The Government looks upon Jaimouth as one of the finast stres for a terminal port and port of all in the United Augston.

Metring a 260-Ten Gas Container—A revent same of the Engravaray Ness Record den rished a novel moving job at Portland, Ore. A gas container 70 feet in diameter and 75 feet high weighing 100 tens, was moved a distance of three miles 1 rist it was reused 15 feet and leaded on rollers. Then it was moved close the city streets and lowered 28 feet to a dock, whence it was moved upon a pair of barges where there it was moved upon a pair of barges where there it was moved upon a pair of barges where there it was unloaded and rared 38 feet moved across newly filled ground for a distance of 3 000 feet crossing a railroad track and placed on its new foundation. It took 71 days to complete the work.

Reinforcing Bridge Piles with Concrete.—A novel example of onnerets work as to be found in the reconstruction of the pile foundation of a long wooden inchway treatle at Port Angels Washington. The bridge at 2000 feet long and crows the bay at thap point on examination it was found that the piles had been badly saken sawy by teredone As it was unportant to maintain the highway trainfo without instruction that piles were not reast wed, but were reinforced by a concrete covering borns two feet square tanded with one rule. The pine of the piles and filled with one rule that was reconstructed by a period of lowest tole and it was not savely to be provided by the piles and filled forms down to keep them from boung floated as the water reas. The forms were made in as foot lengths and if necessary was extended after the first length had been filled with concrete

Raising a Railroad Bridge Without Interrupting Traille—Last year the War Department ordered the range of the Pittaburg, bort Wayns and Cheago railroad bridge over the Allegheny to mercase the Learness by 12½ feet and required that the work let does within a year a time. The operation was printend by introducing jacks under the spans and raising the bridge gradually. The parks were operated only when there were no trains passing and the work had to be done little by little on a single pier at a time, the operations being carried on consecutively from pier to grant of the train of the

Dustiess Macadam Roads.—The roads at the River Rouge Naval Training Camp, Detroit, Mech, have been treated with a surfacein natural of deliquement asia whech have made them dusties and also noiseless where have made them dusties and also noiseless. The great efficiently with water-bound mascadam roads herestores has been to keep them at the proper degree of meisture. They were spit to be too dry, which would result in wasring away the road surface and its dismpation in the force of dust. The causand the road material to break up regardly. If the road wave kept too wet, it was inclined to become soft and would be crushed too readily by heavy loads. But in the roads at Detroit just poferred to, the use of materials such as colotium, magnetium, and other objections from the sail wells, lept the surface at the proper degree of mousture by gathering the monsture from the sit and from the order of the contract of the contract of the first own of the production. A subte yard of the material was found to order production. A subte yard of the material was found to order production.

"Onk Leaf Poisoning of Domestic Animals" in the title of a new bullet no the t. S. Department of Agriculture Investigations made by the Department show that whit an est purey dect of oak aver profuse illness in cattle and often prove fatal these k aves an harmless if combined with ther kinds of food As small a quantity of alfalls have as there pumish don't fed in connection with task k aves pre write possessing to the western cattle ranges the case of each fed possess ing occur mostly in agring be tase at that season there is a search of other foreage.

Penradiae Key —Mr. W. I. vifford in a lecture before, the Botanna Soventy of Woodington recently called attention to the great botan at interest attaching in the penradic some 90 miles a site of lake Oberching the Botan at the least of the Harda Evenglades some 90 miles a site of lake Oberching the some 90 miles a site of lake Oberching the Botan and South State of a gubropical jungle mejonic doy mass. I hough the Languerium sometimes falls he loss the fracting point many tropical plants about of military lossy and palms which have great the atm of frowed Palm State Park to a truck of land in which I indus key su in bade A memour by Mr. 8afford on the physical geography and hotany of this region as to be published by the Smith some some instituted.

Testing of Clinical Thermometers in Europe -It is reported in Nature that sime the Chine al 1 h rmom oler of last October was round by the British authorities half a milion clinical th rmometers have been tested at the Vational Physical I il oratory where more of these sestruments are now tested in a week than were formerly tested in a year It is found that about four per cent of the thermometers fail to comply with the provisions of the order I r m firm of makers having a large output, the number of rejected matru-ments has exceeded 25 per cent while in the stacks of matruments that have been sent in by dealers the repertions amount to from nine t ten per cent French government has recently fill wed the example of the British and maned an order making a minute ry the testing of clinical thermometers a ld in I rance and re stricting the types of instruments that may be offered for sale

The harliest Flan of New York —Dr I ( Wadir of the Royal Netherlands Glosqu'i in all Soutt's who has recently carried out extensive investigations concerning early explorations of the region alse ut the present sit. of New York city, has brought to light an earlier plan of New York city, has brought to light an earlier plan of New York than any private has a Avrording to an account of this discovery published in the first graphest Journal, the map sipe as 1) have been has no ensurey made in 1660s and is was regular areas of interreasing streets, proving that even at that private though few houses had been creted the which plan of the city had been lead out, even it the modern shape? The map, which was found at the Villa Castello in Florence is the only one thus far known dating from the period of Duk's plan priserved in the British Dueston Castelled Duk's plan priserved in the British to be in fact only an inferir British copy of the Patch house.

Sizipa' Balinet as a Source of Plant homises—Intowar of the wild-known damp of the introduction of
most poets into this sountry in the sarth around improted plants, it has been sugarised that such prote
may also be imported in the earth used as balinet in sinsturming from Kurope Carvell investigations pit itsuggested danger have been made during the list for
months by the Federal Horts ultrual Board Warconditions greatly increased the amount of bal ast
brought to our sestem ports as transports carrying
troops abroad mostly returned in ballast. It appears
however, that most beliast consects of sand, gravil
broken rock, and somethyse sabes—but when employed
agmentally derived from given banks or firm escavations
for construction purposes, rather than from cultivated
lead, and is therefore not likely to prove dangerous to
plants. The sand and graved thus arriving from abroad is
untally sold for buildings or other construction purposes,
while the broken rock and soil have been used for fills
mast the waterfores of towed to sea and disuped along
with early waste. On the whole, there seems to be
an serious danger from this source.

### Aeronautical

Bensili a Aviation Service - the ten Proudent sintern has offenile authorized by de re Co 1441° of January Lath 1113 the opening of a special credit it be Minnery of War free a menunt of 2000 of ints of reas (about \$-500 000 in Access on the late of the morganization of the credit of the control of the credit of the control of the credit of the credi

Radio Telephony for Range Sinding.—The exprinent of adjustment if his by ridio the Phonon was an interest to the School of fire at Lord 10 kin. Combined the School of fire at Lord 10 kin. Combined the School of fire at Lord 10 kin. Combined the School owner, radio this phone to most all first telephone the absorts owner, radio this phone component makes all first telephone than the graph equipment makes a still it ampliane observation which seems to operate when the properties when the seems to operate when the seems to be seen to be

Abandoned Avistion Filds—The War Department has hadded as shown the following flying fields Barron I will 1 With Frenz (all I in the Barron I will 1 With I will be a fill I me the I will be a fill I me to I will be a fill I me to I will be a fill I will be completed in I has also I must of General value of the Completed I has also I must off the Completed Will be completed in June 30th met I ta mate detail they can be utilized 1) advantage by some other department to I feel for everyment I be Wer Department a miles they can be utilized 1) advantage by some other department of the Coverment I be Wer Department a fill which I will set I make the shall a will be a mylled by the Completed I will be a fill I will be supplied by the Complete I will be and if a that further details will be supplied by the Complete I will be and if a that further details will be supplied by the Complete I will be a fill I will be and if a that further details will be supplied by the Complete I will be a fill a fill will be and if a that further details will be supplied by the Complete I will be a fill a fill will be a fill the completed by the Complete I will be a fill will be a fill the completed by the Complete I will be a fill the completed by the Complete I will be a fill the completed by the Complete I will be a fill the complete I will be a fill the completed by the Complete I will be a filled to the complete I will be a

karalities with the Christmas Strutiess Biplane With the diath of Aviator July a few weeks ago the Christmas Bulkt has two victims as its record to date the day following the accident which resulted in the death of fully the writer of these notes happened to be enting in the Post of one of the fixing fields on Long laland where the unfortunate arm as was well known and liked Feeling was running rether high among the airmin and mechanics who rititized the design of the Christians cantilever plane which differs so radically from screpted practices. They pointed to the previous collapse of the Bullet which killed another airman fully, so it seems met with the same kind of fate in midair one of the wings bruke off and be was hurled to earth These same airmen and mechanics criticised periodicals which accepted advertising for machines which are of questionable safety. They were agreed according to the conversation that this is a rather late day to experiment with uncertain designs

Civilian Aviation - Its fore operating sivilian air craft including airplam's scaplants and ballions persons must serure a lucase to do so from the Joint Army and Navy Board of Veronautic Cognitance, Building D Bixth and B Streets Washington D C, seording to the Presidential Produmation of Lebruary 28th 1918 During the parade of the 27th Division in New York City a fixing less piloted by an uniternsed civilian flow up and down I fith Avenue above the serade at a dangerously I w altitudo estimated as hetween three and her hundred feet. In case of engine failure the pilot could not have reached a landing place, but would have been forced to I and in the crowd on the avenue. The Board sautons airplane operators against a repetition of such an occurrence and werns that because must be accured by civilian filers Iln Army and Navy Board has control of all are raft beenses for civilians and points out that there is no way of adequately providing for public safety when sirplanes fly at low altitudes ever cities or large assemblies Applications for house should be sent to herctary, at the above whirese

# A Question of Identity

Were Flying Repules Merely Unfeathered Birds, or Birds Merely Feathered Reptiles?

By W. H. Ballou, Sc.D.

Till bard skull : livided auteriorly lo u THII bard skull) Invoked austroom by a
mangh are fined from the repairt skull
as divided by a decided arel. Otherwese
the structural inflerences are largely a
matter of scales on reputies and furthers on
house for this reak board // it grainest
pake out to greatly a first of the first
Massema documber bricks as rethered
when the decided in the first
that there are no a last outful difficulty
between flying reputies and further
between flying reputies and further
massema London deconstructed from
house an London deconstructed from
houses a London deconstructed from Auposa Lomion decessed trade from hips dad, long tailed varion d reptiles which oss, rong tanon a round a repriles which during running, and along a the on by flapping their free ordered extraction Robert Broom Cupe Colony Victoria College derives brids from small Pseudo-Culting drives many remains a small a second and have many a critical and a critical and a composition of the court of the Viruna, gives common union to bords and Yamas, gives comma myan to bords and carraverous dimessings from an intesting which lived in trees and hid shindows feet. W. Ferrgery, Chilandar Lin versats, inside that burds came my from rights sample by losing one of the tem-poral arches in the skull and in other modifications of the primates rightle-family Frod. S. W. Williston, Linvierats, if Chicago, wrote no prior in los recent of Chicago, wrote no prior in los recent death affirming that lives theat a singh arched skull and never mose from double-arched reptiles that all resembles

of convergent on parallel volution and that we know me more about the reptilian ancestors of lords than we

whatever the gaps of opinion between the most able students of skeletons their investigations have certainly developed some most interesting facts about flying rep-tiles and birds Dr H G Bocks, Pridessor of (ceology of kings & Glosse, Lendon, has press need, perhaps the most entitled analysis of the evitine; fiving reptales—118 anon briston are that it was only their outward appear-ances that became extent, and that they medified because of food necessities note birds—in detail he says

To far as the evidence goes it appears that these birds either in the mold of the brain or the impress of the breathing organs upon the bones. It is impossible to say hreathing organs upon the hours it is impossible to say that the lungs were identical in birds and percolactyls, but so far as the evidence goes there is no ground for

supposing them to have been supposing then to have not, of defferent. Phey were not, of course, bards because they lacked feathers, the distin-guishing feathers of the latter, but feathers began to form on them in their time as is ahown in their time as is ahown in the lurasus Archae optarix half bird bull rep-tile

little fear of contradiction that Marsh's fossil touthed birds of the Cretaceous were practically prevoluctyle with some feathering and other small made attors I oothed birds and prorodacts is facked

organic processes the solution of the solution ared reptiles, as they are termed by Pycraft, since reptiles have always existed in one form or another and probably always will exist One of the last admissions of the late Prof S W Williston, the great reptile paleon-tologist, was that it is a nu-nomer to regard the earlier amphibians as other than reptales. Amphibians simply



The penguin, probably closest to reptile of all the hirds of today

represented a more primative age requiring certain modifications as food conditions changed. Weatever of commiss distingtion age to the condition of the condit

its condition by specialisations, content so long as the flesh romains jury and satisfy-

There is nothing exciting about flight a nert is nothing exciting about flight.

It has also as been a simple pro-edure with
any type of aminal that wanted it. Insects
perfected it 25 000,000 or more years agojust as soon as the triliable, one of the first
of animals, could get used to life out of
water place. water, change his segments and appendages and mount on wings. His lineal descen-dants, the dragon flies, still have to be born claim's, the dragon lines, still nave to to norm from eggs in water, and the young remain their four years before suringing upward on wings toward the sun to dry Lixocetus, the flying his gathers spaced in the water russ to the surface expands his breast fine rask to the surface expands his breast ma-above his back in form of a parachite and gracefully flow. Rhacophorus, the frog an amphibian expands the webs of his hind feet, and sails down out of trees—then hind feet, and said down out of trees—then climbs up and does it all over again Maybe some day he will expand the webs of his fun feet and vault into the empyrean Drace the lizard, stretches out his ribs Draw the linearly strictions out his ribs invested with skin, and volpiance out of tru tops Gorko another linearly as well in morely oxpanding a fining, along the sides of his body like a flying siguired. The bat, a manimal, with feath rives wings made out of his for hings re, flice as well and as far as almost any

Dird P(croductyls as primitive flyers, were just as agile in flight and just as warsed in aux and furm as their specialized successors, birds, today Some of them were species

mes and forms as their speciamons are supported by the feather delucia, today. Some of them were species no larger than aparrows, others ranged up to spreads of wing greater than that of the albatrone. While the peterodactyle had revels, the American pieranodon had a horn-shell beak, althought one not differing chemically from those of some lurde of today, and a spread of wing registic alighted on their feet presently as birtle do libroy saided with folded wings the same as furied do, although some spaces are alleged, by dropping the wards with the time despected. As to numbers, the percentage of the said of th drying up of the waters and thur stundity in not knowing rough to imparts by wing to new regime. Fossibly the majority of them were water replies from which our water birds may have arism. The penguan, for instance, which fire only under water, is but a slightly modified prerodactyl, the latter also

used its wings for under-water locomotion

Heoley says that "ptero-dactyle might have lived like dartys might have lived like see birds or in colonies like penguins — In fact, four genera of pterodartyls were as bereft of tail as the peuguin Furthermore, pterodactyls had pneumatic boses, for the darker of the like the colonies. factive had predmane some, for the admission of air, just like water brds and other types today. Very likely, some of the small species had no such air nameres, for no such air passages, for equally, seme small birds of today have sone Pneu-matir bones predicate a four-chambered heart, summon to



Pieraneden, the hern-besk flying reptile from Crotaceous times in Kansas. The creature was a light-weight, eweing to but twenty pounds

scitvities of an animal. The feet of the pierodactyls were distinctly repulsan. It is particularly in the respect that birds, during 5,000,000 years, have specialised to better types. Williston accounted for this by assuming that the pierodactyl foot was used solely for flight and nover for walking. His premise, however, we kname pieromotion, a beaked flying reptice, as having a bead three feet long, article for some twenty feet, and a weight of only 20 pounds If a bulky ostrath can run faster than a horse on two slender tows, certainly a gigantic pierandom, weighing only 20 pounds, could could yasik on weak toes with rudimentary claws and a free-moving fleming, "giving great freedom of movement

to the hind logs.

Flying reptiles and birds have practically identical shoulder gradies, keeled sternium (breast bone) and formulb bones. The flying reptile illiamphorhya hus and the fossel bird Archaeoptryx each had bing forearm bones, with hands terminating in three sharp claws and identical long tails. The fossel bird, so called, lethtwer may be considered the forest birds of the forest birds and in the charge claws and identical flong tails. The fossel bird, so called, lethtwer may be considered the property of a flying reptile and the consideration of soil birds with the forest birds and the consideration of soil birds and the consideration of soil birds and the size of fossel birds collected these by Marsh of March (18), by was not only associated in life with pit reductively, but was not only associated in life with pit reductively, but was not only associated in life with pit reductively, by which the collected thousands of barnes in the Nobertan birds, of flying reptiles and so-called fossel toothed bards many of which to this day remain unsorted, men of sure having been unable to tell where is which. Of course, in classification, we must distrigued as large that we do not know that all of the many spectros of flying propriets and propriet flying reptiles and propriet on the place of two propriets and propriet of the place of the propriet of

Dr W K Gregory, of the American Museum of Natural History, New York, recently addressed the New York Academy of Sciences on the origin of birds. He said

as a the skull of breis is of a medified reputinan type and has no doubt been derived simply by the loss of the upper temporal bar, by the inturning of the pter gend bones and by the collargement of the intermit interes. In short, the whole architecture of the brei skeleton, as indeed the whole internal anatomy, are unquestenably a modified ton of a primitive reputilian type. The consistency of opinion is that the common amesion was nearly related to the primitive Archosauria, or reptile with two arched skull bones. Far back in the Carboniferous specific propriets and other reptilian groups were very primitive reptiles and other reptiles are groups were very primitive tordy aluggish habits and a highly variable temperature, according to Brown, a small reptile in the Perman of South Africa, exhibits inequent adaptations to active hopping out two feet. Its structure was so generatized that the diverse peculiarities of birds group from the trees of the structure was so generatized that the diverse peculiarities of birds and from the trees peculiarities of birds and from the structure of the structure was so generatized that the diverse peculiarities of birds and

In some types of these Pseudomuchians, the body is known to have been cevered with horny plates, but others may have been clothed with overlaping scales which must have preceded the evolution of feathers, the critical steps in the evolution of birds.

A man is as he thinks, and thinking is a function of the brain. If a bird has a reptite brain, it must think largely in the terms of a reptite brain, it must think largely in the terms of a reptite brain to the terms of a reptite. In the sense that clothes make the bird Hence, the bird is mirely a figure of the terms of the terms of the terms of the property of the property of the property of the property on the property of the property loudy, Mrs. Robin lays an egg and so does Mrs. Alligator.

### Francis W. H. Clay

A FTER an illness of two weeks, Assistant Commissioner of Patents, I renew W. H. Cley, thed at his residence in Washington, on Saturday morning. Was 10th. Mr. Clay was born in Richmond by, I forum; 9th 1849. After graduating from Cornell University he served a brief term as Nesset at Learnman in the Patent Office, resigning in March 1980, to inter-private practice. He pursued this secucosfully in Pitchwigh



The pterodactyl, flying reptile with teeth, as preserved in fossil form in Germany

until 1916, when he accepted the place which he held until his untilnely death

until his unitarily death.

Mr Clay From the family of distinguished beatituks statesmin, possessed to a mari i digit i min of the characteristics of mind and the restrict which his vis made characteristics of mind and the restrict which his vis made made companions by with him is delight and an inspiration. It is not strange that one with his impuring mind and capacity for research should have entired the field invention. As evidence of the fact that his mind did not operate, along a single truck we have the fact that himself was grantee of patents for mentions in secral lance. As a lawver he stood high both with the localed and the bar, and served his clair with singland ability and the state of the control of the

### Good Flotation Oils from Crude Tar Products

THE new flotation process for the concentration of various subdictors has hid a very rapid day of purious in the hast few years and as a result the domind for flotation of be to see in the process has been very great. Pine oils and tar oils obtuined by the distillation of southern pure have been one shaded flotation oils but the tar oils obtained by the destructive distillation of hardwoods have not been one-story.

Recent invistigations by the 1 masts of the Forst Products Laboratory, 1 8 Forst Searce and the Bureau of Mines have shown that several hardwood are nish have a very high flottenia whar. Some of the cude tar products obtained in the of I may operation for making wood incloid made egoc citik good flott tonously of the religious of the cude that the second of the control of the religious of the form of the religious of the form of the religious of the form in the form of the religious of the form in the form of the religious of the determination of the religious of the

These discoveries should make available to the mining and smelting companies a large supply of illutation oils and should furnish a market for word distillation products hitherto used largely as fuel at the plant

### Phosphorescent Landmarks

ACLIVIR and novel use of bummons paint is being made at the British front - There are a number of A made at the British front. There are a number of faintly luminous phosphorescent substances ruch as those having a basis of radium solts and the sulfurous those having 1 mass of runnin setts and the suffurous compounds studied 1. Becquered which give of a funt glow, like that from the first at might or in a dark toom. These have long been used for mixing small objects, such as watch dids match boxes (t. visible at might An ingenious extension of such applications of huminous paint has recently been made in the British some at the front Targe we dea lisks r buttons about 212 inches in diameter are costed with the of resaid phosphorement in diameter are ested with the discissing propherses at point and then covered with a perfective liver of cellu-loid. These disks have a sharp pant on the reverse side by means of which they can be affixed to the ground and the sides of treaches or other earthworks buildings fences and other structures. The buildings fences and other structures. They are perceptible at a distance of from 30 to 60 feet. This low degree of visibility is one of their advantages, since they form admirable landmarks for the troops secuting parties but are invisible to the enemy, rither on the other side of No Mons I and or in the air. They retain their phosphorescence for several months before accding to be replaced. These disks are also used in the hand for giving optical signals, orders and information at a short distance when silence is describle. In a similar a sum distinct which simply was little and the sum of the way luminous ribbons ire placed doing a road by day to indicate the path to be taken at highe. Sometimes, too, luminous letters and arrows not as guide polas, and finally luminous devices placed on the backs of stretcher bearers protect them from being fired upon by their friends. The pertinent suggestion has been made that such signs would be very serviceable for the names

### Do Seeds Breathe?

I is easy to demonstrate that germanating seeds take in exygen and give out carbon dioxide A score or so of peas are placed in a close fitting jar with a small amount of moisture. After a while the peas start to germmate, but soon they cause the oxygen in the jar is exhausted. A single is a in a jar of the same size, however will develop and grow up into a httle plant There is evidently anough oxygen for the needs of the single specimen

lo prove conclusively that there is no oxygen left in the jar in which the number of seeds germinated it is only needful to plunge in a burning match. This instantly goes out 1 like proceive of carbon dioxide in this jar is clearly allown by pouring into it lines water, and thus shaking milky in appearant. The would not happen to any extent in a jar in which there had been no germinating seeds.



The jar contains enough oxygen to support the growth of a single pea-vine



and cease to grow

# Patents and Profits

### Why Does an Inventor Sometimes Fail to Receive the Expected Reward? By Dudley T. Fisher

I'l is noturnusly the opinion of a very large number of people that part it is known in neutron or usually relided at far case to a stable washed a sprinkers by a mass falculous wealth by the exploitation of their ill-y tudens

falculous weather 19 He Ceptoraxion is received to the throught the age over of patent monop lies.

Last summer one of the New Yerl pup in carried a potenter of a woman candidate free inaccess and as companied it with the statement life or 2 the planks in her platform was the date. I the planks in life platform vasion that the statement is the full more opolise, and the statement is the statement of the planks on her platform was the date. an hir platform was the date full more opposition, including profession 1 to 10 we can be the historial hold by a great minery join that a partent is a monopoly whether works it 1 it is maker of the capital and close at the express of the mess. I believe that all mark criticisms arise he raise an entirely errorecture on reptions of the native of the monopoly granted by the United Marks in a 1 to 12 me in work that the White mass first when it does not be found that the property raise and the attronger man kept that (which would be more than the problem) and the stronger man kept that the third with a mark of the saws use. He gradually hearted that with capital is resolve man could more than the problem and the problem are could more than the problem.

the first lumin of I man so for his cours use. He gradually harmed that with c space is resolute man could protect his hanamas from a fellow who wes somewhat lagger and stronger than himself. He titen learned that his favorite space was something which he desired to keep for his spear was seen thing which he desired to keep for he are all the second to the period of the period

for instance when the mineral sang is new song that song became the property of any person whe could remember it to sung it. With the invention of printing it became possible for any fellow who he ard the ministriit because possible for any fellow who heard the insustrict ming for score it he soung in such form that he could still it to the public and the people no longer cared to pay the manter! for sungers, I has the manter! for something of value which had former! been has said there ceased to be any men striver for him to saing. We then because fewer new songer and the public host ange. We then because fewer new songer and the public host of a grouper reward for producing new young. In order that manter law might not be destroyed the propie agreed through there didn't chosen it processations to or cognise the manter law might not be destroyed the propie agreed through them. duly thosen representatives to recognise the ministrel duly thosen representative to reciginate at minimizers song as property only requiring that a record he made of the song so that it might be possible to know whether the printer had really stoten that particular song or had produced a new one of his own. In the same way it cod a m w one of his own produced a new one of his own. In the same way it gradually came to be recognised that a man who discovered a new way of doner some useful thing should be protected in the use of his discovery in order that he might be encouraged to work out such improvements

might be encouraged to work out such improvements
And this marks the beginning of patents
Nohody (ver thinks of terming the exclusive possession
to the strict definition of the word it ovrtainly is one It is also true that the people who object to monopolic with the exception of a few of the most advanced social with the exception of a two risk most survained societa, would belk at applying the word monopoly to the conclusive enjoyant by a farmer of his farm and it seems a party that the thomonus word should have been compled with the recognition of ownership in ideas

coupled with the recognition of ownership in ideas. One very important thing to be remimbered, when considering the character of the monopoly granted by a patient, as the fast that the inwanter by exercising the rights granted to turn by his patient is not depriving the rights granted to turn by his patient is not depriving the rights granted to turn by the patient is not depriving the public of the right could apprehen the public had per viously (11) yell. When a monarch granted a monopoly to the give maker he outstaid the providages of the balance of the people but when a patient is granted to an arcation of as of in with the express provision that the monopoly relates to the injournatio of rights to things which had now is from existed, and that monopoly is the monpoly relate to in "layouth to rights to duling which had in wire before evided, and that municipally is granted as a reward for lumping those things into consistence so that the public may enjoy them at the expiration of the term of the patent. The conditions upon which the patent is granted are

ane continuous upon water as parent si granta are first, that the invention must be new If it has been known before the inventor cannel have a patent Second, the invention must be useful II not useful there can be no conson for granting such a monopoly and the government regards the matter as too trivial to

justify consideration. Third, the inventor must make such a full disclosure of his invention and the manner of sure a run unsqueet or the inventer in and the manner or uning it that the public may have full possession of the invention at the explication of the term of the monopoly. These are the conditions which are imposed upon the party of the hest part to a contract I ctuen the inventor party of the first part to a construct content the inventor and the public in consideration of the benefits bestowed by the invanton the parts of the second part that is the public page to the inventor a recognition of his ownership in his ideas for a limited time. The inventor is ed not make known the fit that he has an in ventor ned not make known the t t that he has an inventor. He may if he can, kep the matter subrely serrer. But experence has shown that it is a very difficult matter to use an inventors and keep it a cret at the same time and that it is very good beanasse both on the part of the public and that it is very good beanasse both seems. The public pay the mev store what is an order to the part of the public and the neventor under the public pay the mev store what is an order to worth and the investor uses he taken to supply the with what it wants

mable, with what it wants. But you will all me, there are many investors who do not reap the rewards which the patent leads them to expect 1 believe the greatest cause for this complaint is the ignorance, on the part of the investor as to just what be has invested. It is almost it in unvesting and of the invested that has serve it more than he readly has done. The more insepprent of the inventor that he has serve it more than he readly has done. The more insepprent of the inventor the grafter is his oversetimate of his investion. Every few weeks I have submitted to more version from men who operate, machines built by the company with which I are connected showing new machines which they claim to have invented and which they used to all to our company 1 here is sometimes a relimmentary hadow of have invinted and what they must to all to our company. There is consistent an immentary shadow of
many there is consistent and invitational there is no interest and invitational
many man arrangements of the parts of machines which we
have shready built, and often the rarrangement would
must disadvantageously in some principles of which the
alleged inventor is entirely ignored:
Another reason for the failur is in unventor to receive
the expected in ward, as medificate work on the part of
the sattoracy. I he description up is which his monopoly
is founded in often so poorly writt i that the very sessent
to enforce, has rightly he finds that his contract with the
uplits does not rover many points which are sees it in

on the investment is now one have the account of the public does not crose many points which are sent that public does not crose many points which are sent that a large, magnify of ease, the first that the present of the magnificant of the magnificant of the magnificant of the magnificant of the contract of the construction that has enteredy together to inform him actioney of some of the magnificant of the magnificant of the magnificant of the investment of the magnificant of the mag

attorny Of posses, good agent writing is just like any other kind of work in that it amort by don's descept? If the best results are to be obtained, there must be no simping either in labor or material.

Another reason for an investor not reserving the expected reward such sha he invested another which adoptive wants. After an investion in perfected and qualcularly wants. After an investion in perfected and qualcularly wants of the only way to profit by it is to sell either the devices invested or the patent. If more wants such devices, the more fact that they are presented with and make people pay for thous, and the seven the more fact that they are presented with and make people pay for though and the intervent of the services  The imaging sense the not report to antivalue of any other many such as the only possible outcomes to whom he could sell shippleness to device the services of developing the majorvarient disulting a model and securing a patent, he solucted the complety to purchase his patent. They dold him that they recognised the fact that his investion was an improvement, but it would not add enough to the soling pelce of their apparatus to justify them in paying for his patent and shanging their designs to conform to it A as aboby else could use the myreation it was not necessary to produce the control of the services of the

vantor. One very unportant connected with the procuring of profit from investores in development. Data is machine as worked out into its commercial form it cannot be successfully placed on the market. Often it requires more high class investion to produce the necessary tools with which to build a machine than was required to ment the machine that was required to ment the machine that Tar frequency to ment the machine that I have for the case of the control of the con

of the most important justifications of the patent system. When France Leckner invested has first naming makine, he was years away from its uncessful application to the mining of coal. He produced a re-markably cude model which convined fough A Jeffry that the idea was feasible. Engineers were considered to deam a practional machine. The machine application to the mining or come life progress a Remarkably crude model which convinced foespik A
Jeffray that the idea was feasible Engineers were
employed to design a practical machine. This machine
was built and taken to the more and it failed absorbing
to through any fault of Mayor than the engineers had
because of the man and the failed absorbing
the state of the control of the control of the control
the machine demonstrated what the strains
were and a second machine was built which really did
work. However, during the first year or two the machine went through a course of development which
changed its appearance so much that its own father could
hardly recognise it. All of this development cost more
money than was get out of it during the first few years
and it was only because the people who were behind
it had sufficient copital and enthussaem that it was
finally placed on a paying base. If either the aspital
or the enthussaem had great ones
accomplished, under Without the protection afforded
by the patent, Mr Jeffrey would not have invested the
machine has been invented and developed,
it must be introduced to the public. That is, the people
must be criticated as to the advantages to be derived
from its use. This often more difficult than to overcome the mechanical difficulties of its inventions and
development. Of the there are age long traditions and
prayuders to the revenue. This development of definement of the people, are allowed to share
in the profits of such sfort, there will be small incentive
for any case to take the very evident rake, passe and
labor involved in its production.

in the profits of such effect, there will be small insmalve for any one to take the very ordinal raise, pame and labor involved in its production. In some countries patents are issued with the provision that if the patentee does not manufacture within a certain specified time any person who desures to manufacture under that patent may apply to the Court and receive a line insee under male terms as may seem yest to the Judge. From my point of view this process to the seem of the process of the pro

# French Naval Policy and the Lessons of the Great War

A Brief Study of the Ships of the War and Their Performances

By Robert W. Neeser

IN the light of experience, the operations at see during the Great War have served merely to confirm the persona teaching of history that see power has played a desinve role in the entetines and growth of the Pression nation. France was saved by her army on the battle-field of the Marne But without her navy, which placed is the ridings the industrial recourse of the Western Hemsiphers and assured her the transportation of maportant rendromensents of mer and material at a monsest when virtory hung in the balance, the hercustra of her soldiers and the genuine of her others and the ground of her others and the ground of her soldiers and the ground on the role of the soldiers and the ground of her others and the ground of her others and the ground of the rolliers of the soldiers of the rolliers of the soldiers of the soldi

final victory four years later
A slance at the chart will reveal the fact that Fran-A glanes at the clast will reveal the fact that France sulpyra as evalue stutation for a martimes nation. Her onesis, washed on three sides by the waters of the Atlantic Ocean, the North See, and the Medistranean See, he in the very path of the commercial see routies which today join Europe with the narshers of the world It has been said often that the Franch people have not have not realism that great opportunity and that blinded by many successes of their arms on land they have allowed their attention to be diverted from what has really been the foundation of their greatest victores—

has really been the foundation of their greatest vertormenses power
The naval policy of France in the years which prereded the outbreak of the war was charactered by a
recolation which was been as the recolation which is a second of the recolation which was power.

The consummation of the
trusted the problem created by Bengaror Williams a
maritimes appraisions, and assured the Albes such a
maritimes appraision and for the proposed such as the common flast war reduced to a ride of comparative macrivity
Only once during the month of May, 1916, did the
High Bes Fleet vesture to engage the British Fleet
off the coast of Jutland merely resilfered Ruttain a
command of the sea, and the month of sinces and in
activity that followed Admiral von Scheer a prespitate
trivest were broken only by the against of the armietic. retreat were broken only by the againg of the armistne by which Germany renounced forever her aspirations

It was then that Germany, decrived in her fondest

hopes, inunched her campaign of intensified submarine warfare against the merchant ficets of the whole world in warner against the service at lervin miss exposed lines of communication. During the first few months the number of submarine ainkings reached such alarming

or sommunaction. During too more test montain to mumber of submarms animps: cateled sub-sharmon proportions, that for a time it seemed as if I had been an anomonous and difficult task the remitted as if I had an anomonous and difficult task the remitted to the submarman and the proposed of the submarman and the proposed of the submarman and derived backless to be combat their divided underwes for the submarman and the subm had numerous merchant ficets t second the efforts of their fighting ficets, and innunc relic coaling and supply hases wireless stations and telegraphic cable lines to facilitate their operations. This is what the French Minister of Marine doubtless hell in mind when he de-Minister of Marina countries in (1 in inition with it of clared that in his opinion I rain chould without delay formulate a naval policy contourisment with her commencial concents and colonial operations for all four policies are so closely interrint d that to neglect one is to geopparity the nations of all the other and no one and deny that all four today ar vital to the future of France to enable her to recenstitute her mational wealth assure her economic development maintain her vast colonial empire and enable her t maintain her position

colonial empire and enable her i maintain her positions among the grant powers of the well in a cli in the control who was the power of the well in the control well as the power of the control well as the control was to the control was to the control was the control was to the control was the control

which is being orgid in lance tells in all effort to rouse the people tell a cost to rosting large morehant marine. A few murity or write the newal errice of the Firmy to the a cost on of machine, covery secretice in order to that it is easier to the lattle field. But some that the cost of the lattle thoughts should go beyond the content of some the present and suck to picture the possibilities of it. In it that hes

And these presupplies of the lature well als no great measure after the manal policy who is brone now whigh as a result of the expetations most bring hell white view to assuring a hasting pears. In this the project of a Laque of Nations as bound to have a for a slong influence nor their st would in any way himst France so practious upon this ease for bronestreet as greeners and the second transition of the contract of the programs for obvious reasons have always been extremely much rate presentable to the second in the contract of lor the artimate that is fast gaming favor as that the part of the Loque of Nations will mostly a most of the residence of the transition of the contract o measure after the naval policy which I room moved que the League of Nations will involve a sort of international ism of the Sects of the world in which each naval power ished of the Mexico of the world in which recent acts proved will have a per cified and hunted some to parted in the interest of the world's peace. For Irane, thus rome would most longerally be the Mediterranten See and the water four-hing the wester four-hing the wester four-hing the wester to the hing the wester to the hinge him to be a few and the water four-hing the wester will be clearly of hined and har aval ascendancy unduputed by her Allas and neighbors naval ascendancy unthepated by her this a and neighbors I has does not mean that in the interest of comments, I runch crussers will not be allowed to vast other waters 'pour montrer k pavillon. On the contrary such crussers will continue to afford upp crumines for the exchange of international courteses as well as enable tach power to keep in close touch with its colonial nossessions and its commercial nurkets in zones patroled by other maritime members of the League of Nations

In a recent article in the Saballic Manican it was shown to what extent the French have had been was above to what extentine right a lary had next increased by new construction during, the sare white the againgt of the armstree only creek which were actually on the says have been completed and as fast as these could be launched merchant raft of every step and description have been laid down with a view to antonyming the future needs of the nation

## Correspondence

rrespondence column Anonymous commu nications cannot be considered, but the names of cor-

### How Best To Make the Airplane Safe

To the Editor of the SCHEWIFE AMERICAN In your usus of March 8th last, Mr (nestan Ajello under the above caption has added much to what has been advocated in public prints before and since the armstoe on a topic needing so greater emphasis than the statutical fact that an average of nearly two stalwart nes sentintees race unet an average of neary two scatters men a day have persahed in the training of our armen for the German. War The fatalities are still cumulative and sesumingly point to a time when life-saving sequement will be made computency by impaisive mandate for are averagation, as in due course it was made computery for

water nargation. The state of t

hizaries
Loopung-tho-loop and all such manestress may be permissible as war, but in the national of this art as it may apply to commerce, all such evolvables a submit should be, and will be problemed by rules and regulations, if not by low. A modification of which follows may wall be made to "sea as a reliable within required, expending in a restning collision, in close formation." as also for leadings.

melines be all such problems the cate gan dans of this is by simplicity. Busy one table has observed a colors out lines his generalists for a drop to the earth

knows that the balloon, releved if its load aprings upward like a bouncing ball on life fall is uncontracted yet safety still hangs on the detection many of a para yet actes still hangs on the h 1 copening of a pora-chule. Avisars however mix ext set has operatif it and reduce enormously the risk 1 s, gaming their para-chule before stepping off and till 11 s et ived their drop which would be equivalent to 1 lift up and away from falling of fast traveling aircraft. Such automatic wit-ing is readily attained with ur-injected in handle of parachule. All that is required in it is also are quite and push button or its equivalent 1 in 1 set the sir rate are dues incorporated in the fall in. Thus incorporated in the fall in.

are duets meroperated in the fall r. Thus merchandre, make put is a less passengers or troopers for strategand purposes, in air may be landed with airly without bringing in his is represented a large property of the merchandre for the mercha

night-end up without broken bon a and for that 13 fort diameter seams ample. According to the tabless of re-tardation of weight soled on by gravity a 13-foot diameter parachies will drop 220 prounds 788 feet per second sequevalent to lunguing 11 inches which surely seems a safe margin. The factor of weight is of course of much importance. The writer had apportunity re-ently to weigh 177 equare feet of government parachitic silk which would be equal to 15-foot diameter circle. With the was 12 supersson sords of nearly 800 pounds combined trem-nies strength.

sale strength
All together they totaled slightly over two pounds New York

weight With compressed air reserv ir handle such weight with omproved air reserver rounds stand-an apparatus will weight alm if the punds tital-rall it feve pounds. The figures will I dhammating when we support a omnered in it has erying asy 10 passes ngers each posses nger equip I with life ouving device weighing asy 25 pounds. Using these liquids it will be seen that the ratio of addict accident wide he as 150 pounds w to 750 pounds Surely quite in item to add to the surplus load espacity f any type of flying

SARLES D. MOTO

### Helping the Salvor in the Shipyards

To the Lifter of the SCIPATION AMBROAN In your mane of January 18th hast you write on the above title. With usual precision von thre by turned the limelight on a weak spot in the fabric of economic

The value of your auggration assumes its true mag-nitude when a thought is given to the thousands of slops and cargoos usuk during the war. Is it in it to the sil-vantage of underwriters to insert in this addity incompre-in his with others which this, now require before in-suring a shap and cargo? Is not the go neval public who in the end pays the bill interved it in a string that averag-tioning possible is done it a deguted life and priperty at seal? Had the 14-4 had such incans the lives that were lost would probably have been saved. The value of your suggestion assumes its true mag

I ngmeers know and modern salvage equipment will convince salvors that your suggestion warrants serious thought less we figet one of the most expensive lessons taught its by this war — such means my ven suggest with tangen it is don't get out to ten more expense research
aught in by the war. North means my via augest with
approximate strength of perhaps 200 tone cash can be
very conomentally placed as y 21 feet apart along the
adea and above waterine. With an operator protected
by any sort of a diving bold slop anlyage from 1000 or
more feet could then in the future be accomplished ship and economically

speedily and commonically
Will you not publish this in order to invite discussion
of this important subject!

CARL J. LINDQUET

# Oddities of the Trans-Atlantic Flight

A Review of the Attempts of the C-5, Sopwith, Martynside, and MC Martine

All III all the crossing of the Athenic is not completed before its firm in the mon-difficult their lead to each tropped to be an in this years of treed existing de səloopucit due t the keen sivalry I tween warting ervalry I tween writing powers lead I existin men and the world of long to lich two filled in the tweeth of the world of the well within the power lightes of present lay michanes One may have all the power with the power within the power light of the power within the power layers and the power layers a everse to bring him to nos and meetinty

amplant and the thrigible set developed in bong-distance flights and in adverse set the Indie I there is no manufacte danger of the

strangler lines going out of business! fortunate disaster which put to 11 5 Navy diagold (5 and of the contest. This

amali dirigibli mesa iing under 200 feet in lingth had mach the light from Montank Pinut Lang Island, to Ni wformill and ii geord tinu and shape. Arrangetion and shape Arrange-ments were completed for the start of the trans Atlanta flight I vorothing seem dun favor of the drighth has luck would have it however n wind at irm cause up and the daysthic was torn away from the moonings and blown unt to sea Since their no trace of the diracible has

loan found.

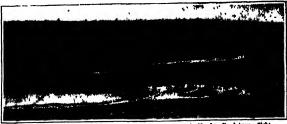
From an authentic source we loarn that the 4-5 left shourted Pourt with about \$25 gallons of fuel the greeness to the jumping off place at Newfoundland required but 200 gallons and there, at all rennanced source what in exerce of 500 gallons for the tanker. When the boon funnd in the ranks with the C-5 reached Newsonndland there was a steady fuvurable wind blowing in the right direction and the crew were arrection and the crew were anxious to take advantage of it. But their orders were to land, and they landed and anchored their designifi-

in the open. If the dirigible had pushed on across the Atlantic it would very likely have made the crossing at an oxerptional speed

I verything performed to perfection in the C 5 The Union cumus were at no time pushed to the atmost

An interesting feature of the Montauk-veyfoundland flight was the burning of surplus hydrogen in the engines Instead of releasing the hydrogen into the atin the engines together with the required amount of air. This pipe have rented in county rable communication.

As for navigational difficulties, it is harrod that the radio direction ha let served ta good stend On mac than or more the rathe over ator came to the resence of th navigation officers and told them the position of the dangible But swing to the fact that the directional wireless only given the line of a station sending signals



The NC-4 taxling on the surface at Tropassy Bay, preparatory to the Newfoundland-Asorse flight

but not its position on that has th C.5 was "hast for a two house toward the end of its first However, under regarder continuous the distinct where the proved of considerable and in cut it investigation. Its population determines the position of the sending station

The ( -5 in the hanger at Montauk Pount, Long Island

by noting the intensity of the signals. After he determines the line of this signals, he has morely to note whether the signals grow louder or weaker to determine whether he is approaching or reconding from the state.

As for the disaster which befull the C-5, it is said to



Hawker's Sopwith highans, equipped with a 400-hersepower engine

blowing at a high velocity and most lustily. One after another of the heavy anchore on would be blown away, rip cord was pulled by last man aboard the dirig It broke just short of the part engaging with the gas-bag patch. And just at the bag started on its wild bag started on its wild journey, earlying the dang-ling our below it, the last man aboard jumped some twenty feet to the ground

A dirapble, unlike an arplane, is safer in the air than it is on the ground. For in the air it like air than and is not subjected to great eiranis, whereas on the ground it is accuracy to and under the blows of the wind as subjected to me vere strains. Had there been a sind to ground it is accuracy to a course the C-5, the acculant.

recure the C-5, the acculent would not have happened Again, if the dirigible had been tred out to a mooring tower, as the British have done with their small simplifies, the wind would have caused little if any damage 'in all in all the dissester nervi a once more to in-dicate the vulnerability of the dirigible on the ground, and the necessity of moorning

and the necessity of incorring towers or housing fashitus. Then there has been the ill-lated attempt of Hawker and Cartw. who started out on the great flight on Hunday atternoon May 18th, from Newfoundland II overy-thing had gone well, thus from the fashing and these bopwith team would have reached the count of Ireland the next day, some 20 hours after their start. At first there were wild rumors of the sighting of the bopwith off the coast of Ireland and the sighting of the Sopwith off the coast of Ireland and even above: ertain districts of Ireland, but as time passed these runners proved to be infounded At the greens writing, four days after the start of these intropid airning the world is without world from them, and it way met the same fate as an

s one cortain that they have met the same fate as another of their toutitymen, Gustave Hanel, who set out across the English Channel and was never beard from again, as well as the Prochman, Leutenant Bague, from again, as wen see the Mediterranean who at out across the Mediterranean While the Sopwith

urd a wireless set, no land sied a wireless set, no land station or steamer picked up messages from the str-sien Not oven a farewell missage came back to the sasociates of the Bopwith train at Newfoundland Yet the wireless set had a range of over 100 miles, and it would seem that at some time the biplane was within that distance of some of the trans-

dutance of some of the trans-thantic liners and freighters. Lattle hopes were enter-tained for the Sopwith under-taking even before the flight. Heavily loaded, the Sopwith huplane had to keep its engine going at the full out-put, until the load became lighter as the goal was ap-

severs strain on the engine. In all, the fight was to take more than 20 hours' time, and it was regarded as problematical in the ed as problematical in the se whether even the best on engine could maintain awistion eague could maintain the full output over so long a period. Then again, with a drew of two, only one of which was the pilot, there was the great danger of falling askep Military arrans agaged in long-distance of the difficulty of keeping awake of the difficulty of keeping awake during long flights 1 he steady drone of the sugare, the effect of the abser, old air, and the removal the absert of the sugare, the criter of the sales of the sales. arone or the engine, the effect of the clear, cold air, and the general ennus of such flights results in sleep. Hawker was a fine of long experience and no doubt knew

superimes and no doubt knew how to guard against falling broke, direct as a superimental of the long strain, or the armon new adverse weather conditions and exhausted their fuel Again they may draw drifted far off their cours and run short of fuel All in all, the Hawker attempt has justified the governal stepsitions towards the angle-engand sum-kne for the rana-Atlantic flight. In betting odds were lost a superimental of the strain 
it is interesting to note bow this supposedly sturdy ma-chine broke down while starting. I rom press accounts it appears that the Martynaide was rolling along at about 50 miles an hour for the 'take-off, 1-1 when it struck a little mound which broke the under Popul н arriage and dam-aged the machine beyond immediate ripair Thusacci-dent brings out the fact that a small trans-Atlantic machine must be loaded to a point where it



is dimensional over dangeties to "take-off unless the flying field is well-migh perfect Meanwhile our NC boats have been in for an exciling time Starting from Tropessy Bay in Newfoundland, the NC-1, NC-3, and NC-4 had every chance of making the NU-1, NU-2, and NU-4 had every chance of making the dight a success Destroyers were strung along the coute, ready to offer succer of nocessary as well as met win less against for the direction of the arman. Yet only one NO bost came through the 1,300-mile flight, namely, he NO-4, which was the very plane that superferred no end of troubles and breakdowns on the way up to the

me end of troubles and breakdowns on the surface, and ank of "unpumped" in place.

The Nf -1 was forced down to the surface, and ank off Covre, the U.S destreyer "Farrfax" bing unable to salvage her. The crew, however, were saved. The body of the machine gradualty gave way under the pounding of the heavy seen, and the wings were broken of As the water continued of the little body, the machines down settled out of an analysis of the transport of the course and in term, pot off the roune and the term of the course of the course of the course and the course of the course

that his navigator might jet ings The plane was by the running we and is to rise. Pounded by to rise. Pounded by the both lower wings were



The special motor unit for Army relief organizations with trailer

In order to conserve such to I is was still in the tanks the NC-3 crew decided to soil landward. It required some 48 hours for the duty of 10-5 to reach Ponta (Contine to  $f \in \mathbb{R}^3$ ) and

### The Travelling Army Auxiliary

DURING the late unpit countries I rance was full American soldiers it was also full of relief organ American source it we also into relief organi rations of various sorts within for the confort and softly of those soldiers. The vallers didn't stay in one sput consequently the doughout pris and the M.C.A. servitarios and the other by the engaged by M.C.A. servitarios and the other by the engaged by M.C.A. the londibuy a life as which with living on the incum



Folding gas stove and dust- and water-sight supply pantries of the travelling Army Aid unit

stances would permit, doint stop vity long either. When the dengabory goes away from one spot to another, be taken a train if here is one in take motor truck i ransport if their are any truck but mostly be walts. But the relief organizations have it atket ther worldy goods with them when the worse and they have worst to function whall moving, so walking no out of the question. It is, accordingly increasing for their bodies to be provided with some and of conveyance, and the more insartly that occuvance approaches the siteal of saving been deagned for the express service in question the more saunfacetory it will be, to its users and the better service is users to any even army while its mention. It need not be fall strange therefore that a p cal

type of motor conveyance will drugged for the purpose of mov-ing the American relief organiza-tions around the Freigh land-lenge. It was get up by A. J. Moulton of Newport R. I. It resides have pure for the recedes hising quarters for a

573

priy fitty with cooking any rating 17 was no and and of a rapport for first and the call the chooses at the unit and units of 142 and wheelers the no fexten be were the friend, was the large to the north angle are easy for those love the night. the cuts I died and covered by tent his structure os pictured. Lear fith occupants skeep in the cut utent the car and the fifth

The furnishings of this unit include four cots five stools und a new thick the two which I males earned the cuts the stock the deline and long for the personal off test the numbers then just above the running is ut of the crisull the four-horner gosoline stort is loss it. I have fed from the name gas sank of atous is located. This is fed from the many gas tank of the rivath garms struct rep with first. He can be folded back with most of me units a compactment that ace monotone of this rate mine a bread board a war-bread; return per and other cooking strained. Pails coffer per supply why not copy folding frying pairs and the rive is prefer in a case on the running board head this or Principle is real in caryas and nice late large.

lurge medical an I surgeral cabenet 14 carned together with a writing desk with ispowriter non-spiling ink well els Indi valual lockers are provided for the tallet efferts of the tures along the m ade of the car at various points in ils an axe a wash-hoard a collap-sible tub canvas burieta brushes. a water hiter and two cantenna

the tent whi surmounts the whole outht is strapped under a over on the top of

over on the top of cling. It is fastoned to a ridgepole and cas be quickly pitched to cover an area 20 by 1 feet. The two rooms has formed cash 7 1, by 13 are warrant by the car, but connected by c passage of the trar. There are no gur ropes or pass, but souther and a better means of anchoring the first but for the passment when there is one, or to the ground when there is one, Modeline De-

### Motion Pictures and the Eyes

MOVING putures under favorable conditions, do not cause so much fatigue of the eves as the same

Print cause on much rating or isn two as an assume per tool of consentrated reading.

When there is to discomfort there is usually some and the feet which should receive the attention of an expension of the conditions of the conditions of the conditions.

nerving pictures existing fatigue, if continued, become unpleasant

distincted, become unpleasant many of continued, become unpleasant many of continued to the continued of slight me in tenses the continued of moving putures can be seems



The Army relief truck, with test pitched for the night

# A Shooting University

The Great Naval Rifle Range at Caldwell. New Jersey, where the General Public Will Be Taught by Experts How to Use the Rifle

By Capt Edward C. Crossman, U S A.

Photographs by T E Sandies



May 31. 1019

A SAHOR is a person popularly supposed to have more to do with dancing the hore paper and splicing the main-brace than with shooting the multary rifle. Even to associate the navy with light hours I ng and swift leatrovers convine and lattled ups not with the shirt brown highly accurate rill. If I selections land fighting

Desnite these ideas, or most efficient Navy Laying put into being a chan I great rifle ranges the country yers and having male in re-fits men simbers considered into expert shets than did the army now propose to stage the biggest rifle shoot the world over saw during the months of July and August The place is Caldwell N. J. 45 minutes from Broad

and within an hour s ride of some 10 million people Formerly a very wet and unprepossessing section of New Jersey known is the Creat Li or Mendows it is New Jorses Rhown is the Veral 11 of Strangows it is now one of the Navy suffer range and is first graduating from marrly one of their rit the greatest rifle range in the United States as it will be I vili

time the opening gun is fred For years the National Matches

have been staged by the Unit d States (covernment in cooperation with the national body of organize i military riffemen the National Riffe Association For just is many years have the National Matches been the annual conven tion and the cleaning house of rife information for the enthusiasts of the country -at least those a part of our regular and militia for

of our regular and minute forces.

Their weak point has been that they permitted only teams of militin from the states aid regulars from the Army and Navy and Marim Corps to participate, and the plain ordinary. Mister the civilian who liked to shoot the plan ordinary sinter in Caulain with the indicate of anonother rife but didn't care to the up with the indicate warm that rally encouraged. I won the they were great affairs with teams of 20 men from each of the states tums representing the Infanty Cavalry Marine cops Navy and Naval A ademy of our regular ferces all arguing out the final team championship is the National Feam Match and the individual in itcles in the prehiminary shoots that came first the National Individual of the Government and the program of the National Riffe Association. In 1913 the Pau American and Inter-Association in 1915 the Fan American and inter-national shoots were bold at Lump Petry. Olion con-junction with our National Matches with Argorithm Peru. Canada. Swodin. Linner and Switzerland all sending their teams and playing in the 400-incter game in

er own pe ular style All this time however the civilian rifle clubs had been

growing in numbers and incomence the members plain ordinary. Matters who were shotting the military rifes under the regulations of the g. versiment made possible by the regulations permitting the sale and loan of Covernment arms to such clubs: clonging to the National Rifle Association
In 1916 two rifle enthusiasts of th Bolshevik order

according to the standpatters of the game Major Harilee of the United States Marine Corps, and Major Brookhart of the Iowa Milita got ti matches open to teams of civilian riflomen from each stat. With hardly a teams of civilian rilionium from each stat. With fairful a month a warning and with the stand, it? so the powers that is doing their best to discourag the project the National Matches were opened at lacksonville Fla and there came streaming in from every state and even from far off Alaska teams of enthusiestic civilian rifle men the most tickled and the most strangely attired but of riftemen ever seen on a range snot the days of the proncers and the days of the bakwodsmen bome



National Platel Match shet in the rain (amp Perry, 1918

of them were these cuts union out nuits favored by shooting uniform Prom Okalahous came a real wild west team quite like the real wild westerner big-hatted and one or two with notched guns Habituated to paying a paternal Government al. it three cents per cattridge for the privilege of sli clung their beloved Springfields for the first time th v had a taste of the

Springheids for the first time the lind a taste of the milities privilege of free ammunit; and they waverned over the range from dawn to dark.

Nearly 60 teans mostly of enthans fact the targets after the preliminary individual matches for the team march the event of events of the Nation in Matches. Findaments with the same of the stronger states in the same of the stronger states and the same of the stronger states and the same of the stronger states that the same of the stronger states then came a team of California civili one picked from just then came a team of California civili one picked from just the same and the same state of two civilian rifle clubs and took eighth place defeating all other civilian teams and most if the militiamon and cating the Marmes at their own rings of 1 000 yards Many of these civilian riflemen went into the service

when we entered the war, some of them will never return from France In 1018 the matches were again staged at Camp Perry and again the dvillan teams cause streaming book, this time much depleted, mostly new men, but still enthusiastic and determined to learn all there was to the game of hitting with the brown service rife the things, Hun or otherwise, that needed hitting

In 1919 the powers that be, in solamn conclave, made the startling move of giving the matches to the U.S. Navy to run on a Navy range, in recognition of the great worthe Navy had done in building its ranges and training rta men in rifle shooting. The entire crows of the great railway 14-inch guns sent to France by cur Navy, and commanded by Admiral Plunkett, were made up of the

commanded by Admiral Plunkett were made up of the expert nifemen trained on the Navy ranges. In turn the Navy turned over the job to the great organiser, Leut Col Harliee of the Marines, who had built the chain of navy ranges through the country mostly on a shoe string so far as expense went, and by the work of Navy men alone For

the first time the enthusiastic Marine officer was given a free hand at a National Match, and that of 1919 promises to be the start of the movement to make the Americans once more a nation of riflemen. Gone is the idea that a

Americans once more a nation of reflemen Gone is the idea that a man trust 'belong to some layout or other to be allowed at the heart of the contract of the short of the shor

WOTH HYPE
For the first time it has been recognised that the aborgun the rifle, and the patol, differ but little, and ought to trot on the same track. The trap shboting devotes as going to have a chance to play his own game right next door to the hang-out of those queer parties who think (Continued on page 588)



The rapid fire stage of the National Individual Match, Camp Perry, 1915

The city wennes thispier trains Halliand Minish

# The French Problem of Reconstruction—IV

Some of the Details of Agricultural and Industrial Reestablishment By C. H. Claudy, Special Correspondent of the Scientific American in Paris

It is typical of rural France that almost invariably the first thing rebuilt is a grange or grain barn Your typical French farmer doesn't live on his farm, as doesn his American course. Frunch farmers gather in the hundred of little towns which are so close together in France that one can almost shout from one to another Their farms are for farming, their towns for itsnig, and Their farms are for farming, user towns for hving, some while the town, as a town, may not seem so much in American eyes, it represents to the French farmer all that his life holds of greamousness and social inter-course. So when he begins to rebuild his farm, he thinks course So when he begins to rebuild his farm, ne tunna-first of the typical farm building when he begins to rebuild his town, then it will be time to think of the dwelling. Meanwhile he lives in his barn or a tent or anothine which is half a shelter To aid

a depart or anything which is half a shaler. To adhan as singles anything which is half a shaler. To adhan as Sadding such, the government has ordered more than 25,000 demountable vooden houses of a couple or three rooms and an outbuilding at a cost of less than \$1,000 cach as well as 10,000 demountable farm buildings cottant from \$1500 tes800 sech.

Also, once more, here was good effort lost, for several thousand of these were set up and cocupsed and in the path of the less than the same of the several thousand of the less than the same of the path of the latest the path of the latest the latest the path of the latest the latest the path of the latest latest the latest l rounding a destroyed cathedral The cathedral is undoubtedly the world a most tragic and most wonderful rum, from an tragic and most wonderfur rum, rem an art and a sentimental standpoint, but what of the city in which the cathedral stands? This dead and silent place, those thousands of houses, of walls and fallen stones that once were houses, these multitudes of empty staring spaces that were once homes, these poles on which are no wires, these tramway tracks on which are no cars, these cobbles over which pull

are no cars, tasse coorses over which pass no horses, this town which is now no town—and Rheims is but one of many if the largest Wherever possible French troops are being used to supply labor for reconstruction work. It must not be not forgetting it But she is also not forgetting that idle troops are troops deteriorating and so General Petam s order to all military units located for several days in any one place to offer their services to the local engineer in charge of reconstruction has resulted in a good deal of otherwise lost affort being directed on the rebuilding

profined
One of the great problems, of course as the housing and
the feeding of the army of workmen who will do the rebuilding. But France has recognised this difficulty
and has provided ample funds for both, as well as the
spending of those funds the purchase and the trans-

portation of the temporary quarters the maintenance of lines of communication with the mercut base of supplies for any dustrict to be invaded by reconstruction engineers and labories. I rance has not warred with a Hun for four years with the learning how to support troops in the field. She now has a special service divoted entirely to the sup lying and creeting of barracks when yer needed whether? refugees or for working in

I rance is a country of st in and cement tile and brick.
Wood is little used for building. It is too valuable and
besides it lurns up, and will would build a town which might burn up any time might became a little careless with a segarette, n'est a pas? So the government through its Technical Service of Reconstruction is exnting with various building materials to see how permenting with various panting matterns of the those found in any one spot can best be utilised and has a

THE PROPERTY OF THE PARTY OF

Replanting an orehard in the devastated region of Prance

laboratory in Paris for trying out new situs of construc-tion coment mixing brick making building etc. In addition thas narefully mapped France with regard to hor quarries and other earth found materials so that there may be no useless waste of transportation in getting

there may be no useless waste of transportation in getting area materials to the place at which they are to be used for transportation is the met. If the battle to use a American expression in the whole building program. There is no lack of building material stone by a sand, lime, the, cement, ran be produced and are pri-duced in most of the affected departments. What is madelate was admission, and they not consider the madelates and the second of the second needed is machinery and tools and coal—and trans portation, and it is these things which the reconstruction authorities are trying to arrange rather than the in-dividual details of materials. But it is a slow process with the country to be work I in a run with the best

men killed or went I d and the rest away under trus And all the while it we who work must cat. Hence the recetablishment of agriculture is of paramount in portance portance. Here the government helps with its tractor service although the help is short of the requirements I or instance, two years ago a milli i acres were released from Hun domination of which the half was cultivatable The French tractors plowed 80 000 the French arms 12 000 and the British arms plowed 90 000 of these area lodgs the government owns more than 15 00 tractors of which more than half are for use in the

decastated regions
Usually of course the French farmer does his own plowing But usually he has his own firm beasts to plow with What the German s didn't take his own army did there are few horses and mules left for rural service

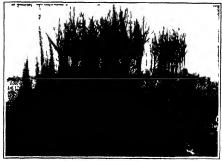
in I rance foday Twelve thousand horses in month were swallowed up in the armore the result is that where the service of Agricultural Reconstitution is otherwise ready and anxious to put refugees back to work on their farins and to provide them with German prisoner labor, it is often ivailable power with which to plow and 800 tractors can't do it all! More over even if some one were to pre ent a twitnoisend horses to the people of France his to I also France couldn't feed the a male if she had them. But she can I ditractors and she has ordered many I ractors and much farm machiner from America are what is needed. And the mid is at least double that of the \$000,000 worth contracted for by the 1r uch government so far

Alterether resumblishing rural krance n a productive state seems to be a vicious irck. There must be crops to fred the animals which must be fed to pull the plows which must function before there an be crops the crux of the matter of

an be crops the rink of the matter of ourse is lad or an U that can to be lad until the military startion permits. Let no American say "Oh devasive of the control of the c

intensively farmed a way
With 50 millions of dillars to its credit the Office of Industrial Reconstitution composed half of officials and half of manufacturers has gone bravely to work to resetablish the shattered industries of France great a task this is can much better be imagined than described. It is not a case of starting up an industry (Cmimu ! 1 pag 188





Taking out young apple trees from the Government purportes for distribution

# Testing Physical Fitness with the Camera

The Mensurgraph a New Aid to Photographic Measuring

By Robert G. Skerrett

I T is dawning upon us that the physical will leng of every American is a matter of national on en Likewise is it casestal that we have at our sumana facilities by which our bodity state, may be the ked up venified, from time to time. This applies to the world ventions by which our boday each may be an act upvention, from time to time. This applies t these of
adult years as well as to infants and typerally to our
vouldul citizeney during the permit is a later time.
The question is, how can records be under attentiable
metervals which shall settedy the continuous at external indices of development filluly is irrested.

menoe has furnished a verst t Second has furnished a virit it means and apparatus deup it serve these ends but it is juilable, not an exaggration to act that the art of physical appress in all it is marked digren in a state of the We are interestly forling if wit tware thereally forling if wit tware thereally forling if wit tware the good of previous air day by day it is becoming plaint; the the out ward aspect of the both has much to tall us if we are keen enough of vision to read arisely. to read aright
The trouble up to now has been the

The trouble up to now has been the lack of a convenient system that would give us positive data of all phases if our superiosal contours and surface-at any moment and which could again

see any moment and which could again be measured during a series of prescribed observations. Sufficient nour-subment or a lack of its plandy indicated by the outward appearance of the physique Similarly muscular upbuilding due to simulating exercises will fell its own story outwardly and a lack of dichipmental bladance any difficiency that has an exterior reffer and there are many of these—can he noted by the framed observer. But the principal difficults, to successful interpretation in the long run as a succession of search with will load themselves to really nuce comparison. The labor laws of certain of our States specify that children between prescribed ages shall not be employed in guantly pursuit unless they have received qualifying certificates as to like a fariness for any work in which they may be properly engaged.

pertineates as to their many may be properly engaged fhat is to say hoys and girls from 14 to 16 years our army of workers on they have been found sound enough boddy to meet the stress thus im posed upon them I he burden of establishing this burden of establishing this status rosts upon duly authorised examining efficials lines officers ex-ercise a large discritionary power and offhand per sonal impression plays a conspicuous part in the decision. This invited crior decision. This invited error for which the child first, and then the parents in the community must pay

These youngsters a which there are agreed many thousands, are restuited annually to our industrial ranks, and that they may be a source of strength not subsequent weakness if is vitally essential that their

witably essential the burdens and these same plots of the same plo

the external phases of the physique from all sides. Not only that but because of the way in which the plate are made one scale of syntuation will answer for a serie of prints taken at different dates it has permitting every close comparisons of interesting bothly changes like to nothing fundamentally new in the recourse to plate agraphy other have used the camera he fore for the maint purpose, but their procedure has been faulty or monothal the series of the procedure when the procedure is a been faulty or monothal the series of the search purpose. in important respects

These drawbacks have been eliminated by Dr. Kilmer and today he makes it possible to take any number of



Arrangement of apparatus for taking mensusgraphs and enlarged view of the stead on which the patient stands

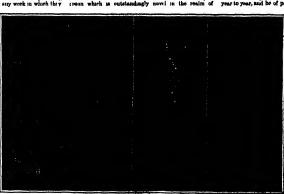
photographs at suitable intervals and to do so us photographs at nutable mtervals and to do so under ircumatanes that are practically identical. That is to say the light is always the same because he uses a powerful mercury-rapior lamp. In foral dustance is unvaried because the capters and the stool upon which the subject stands are just as many fest and inches apart, and the less us at a certain hight above the com-mon food level Finally, the person to be pritured placed has heels or toos upon limiting for formits which are he for Dr. Klimer has introduced no feature of pre-cream which is outlandancily never in the realin of

graph taken On his permiting paper, before it is exposed, De Kimer stamps a smiller symbol, and then laye his putture asguive upon the paper so that the two Tames on the paper and one to high the smaller permitted. Another place, opaque and ruled un measuring enquares as substituted, and the paper in one more apposed to light. In the case, too a T mark on the negative namer proper registering. When the doubly exposed paper is developed there is produced a parties at emissive living beneath as reason in fine which represent feet and makes or, if as a saked, inchas and fractions thereof if the paper is reveloped after the posture outsire his continuous contents. In this way, Dr. Atlance can secure a vivid photograph which shows every superficial detail of his subject and thus he can examine without having his eye affected by intervening lines, or he can other the asset picture oversial with a zeros of measuring lines. The latter the mewore calls

or he can obtain the same picture oversiad with a series of mountainty of the can obtain the same picture oversiad with a series of mountainty of the can obtain the same picture oversiad with a series of mountainty of the can obtain the may desire for purposes of analysis and a number of these, taken at sutable intervals, furnals a comparative record of the stands of the can obtain the same play with equal preceding in each given its due weight Finally those photographs will call their story to any qualified observe, whether it be he or someone cless who took them. The measurgersph meshed devised by Dr. Kimer will lead itself to many useful applications. It will understood the comparison of the comparison of the comparison of the comparison proteining outcomes of the study of the changes modeling out when it was the study year to year, and be of periodical values in which these changes from time to time in the same of the can obtain the same of the comparison of the changes from time to time to the same of the can obtain the can obtain the same of the can obtain the can

changes from time to time in the cases of resident children, either of domestic or foreign birth of alien parentage It is and that the American environment tends to blend racial features into a general native type Dr Kilmer has provided mean by which these modifications can be recorded with iluminating precision Further, mensurgraphing will be a great help hereafter in all X-ray work, and will tend to reduce to a minaum the errors which are all too common to reading or adjudging the revelations of the radio-





A monsurgraph of a boy's boad

Development of a boy as indicated by the tamera

photographic exectness, but his method does merre of preturing the subject from time to time in the same focal plane and from the same point so that any super-ficial silication will be registered in fixed proportions upon encourage suggester. But how does he make it practicable to measure these contents and surfaces to a newly and that is o'vergingle properly say obsages which may occur? Here as where he has introduced something decidingly mer. On the front of this sheet are two heavy black linea-ress horazontal and one vertural. These lines form a T-fills registering mark at the hottom of each photo-

### SCIENTIFIC AMERICAN

### Some Startling Electrical Phenomens Obtained with New Form of Vacuum Tube

A N enthusiastic wireless experimenter was at work in A his laboratory, when, by chance, he happened to squech the glass builb of he yaouium-tube detector. Immediately he detected an amasing result by means of his telephone receivers. His curroutly was aroused. He wondered why he had obtained that result, and in his quest for the reason he came across a new form of recuum tube for wireless and other purposes

That enthusiastic wireless experimenter was none other than H. P. Donle, now the radio engineer of a large electrical company at Menden, Conn When he filed

his patent papers at Washington, D.C., the patent examiners came back with the blunt statement that his invention was impracticable. Whereupon Mr Donle went down before the examiners with a complete laboratory equipment, gave a demonstration before the expert electrical men of the patent office, and secured a basic patent on his invention

Vacuum tubes, as will be recalled from the numerous descriptions of such devices and their application in these columns, are modified electric lamps used in wireless egraphy and wireless telephony, as well as for land-line telephony Such vacuum tubes can be used for detecting highfrequency electric currents, such as rudio waves, for modifying or modulating or relaying purposes in wireless communica-tion and in telephone work, for generating high frequency current for wireless pures, and for amplifying or building up currents to powerful ourrents

What Donie discovered was that it is possible to pass ionic currents through the glass walls of an incandescent lamp. In fa-

In fact, by placing gases wants of an incandescent ramp. In law, oy placing a metalin cooting on the exterior walls of any ordinary lamp, it is possible to pass several increamperes between flament and this exterior coating with a potential of 20 voits. In order to determine if it were possible to construct a thermionic rectifier in this manner, Donle set to work constructing several tubes containing a metallic filament and a metallic coating on the external It was found entirely practical to pass currents of considerable magnitude between the incandescent fila-ment and the external anode, the operation being about

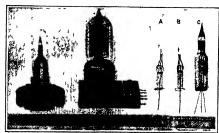
After the filament has been heated for a sufficient length of time to warm the walls of the tube, the electrons emitted from the flament strike the walls and the current is conducted through these walls in the manner descri later on This current passing through the glass increases its temperature considerably and as the conductivity ction of the temperature the current will increase for a short time after the connection is established

The anote current will therefore, depend upon several factors: First, the temperature to which the glass is rused by least from the faluent, so ond, the anote potential, boardes such factors as thickness of glass, distance from the cathode, and so on

Thus we have glass which is heated by the radiation from the filament to a sufficiently high temperature to allow a small amount of current to pass, and by the passage of this current, the temperature is raised con-

The results from tests of this tube showed some very possibler characteristics, one being that the operation depends to a large extent upon what metal is used for the anode A series of experiments on glass samples demon-strated at once the cause of this phenomena

Samples were prepared from a short length of tubing with an electrode fused in each cid. Later many other arrangements were tried, but each gave substantially the same results as the first arrangement. These tests gave



New type of vacuum tube at the left as compared with a standard vacuum tube in the center view. At the right are desired the various steps in making the new tube

most satisfactory results. Conduction through the glass when heated was of quite a different nature from that which might have been expected. It exhibited all the characteristics that occur in conduction through an the onaracteristics that occur in conduction through an electrolytic. The three most noticeable phenomens were 1 Polarization; 2 Increase in resistance distributed from the formation of noa-conducting layers on the electrodes, 3 The deposition of the products of decomposition on the electrodes

composition on the destrodes. With like clostrodes of proper material polyarisation with like clostrodes of proper material polyarisation takes place in hot glass precisely the same as in an electrolytic cell constaining, for materia, a distinct solution of sulphure soid and having platnum electrodes. The second effect, ingression in insistance, was in the construction of a practical detector of the greatest importance. Thus effect depends entirely upon the material of the electrodes, for example in a sample of lime glass with material electrodes, bacted one syd out great 6', and an applied E. M. F. of 20 volts when the circuit was elected the current marks amount to fits multimaterial. and an appared E. M. F. ON JOVEN WHEN THE STRUCK WAS closed the current might amount to five milliamperes, but in five seconds this earrent decreased to less than one-tenth of one per cent of its mutal value. With silver electrodes this effect is almost entirely absent, and with a tube having the electrode of vilver and one of (Continued on page 89)

A Successful Type of Anti-Noise Transmitter and Loud-Speaking Telephone

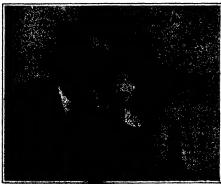
TWO years ago it was the common behal that telephony aboard in hiplane was impossible. How could one talk into a transmitter with one or more un muffled engines rearing but a (ew feet away? How sould one hear with the thundering engines and rush of air and the many other som is mortental to airplane travel? Frankly the problem seemed almost impossible of solution

At first when the call for telept m apparatus for surplane use became imperative not only for intercommunication between members of the crew but

for wireless telephony nyentors set to work on various schemes for bailing out engine and other sounds while confining the voice to a small chamber containing the telephone transmitt; Su h schemes, however were not successful. The roar of the engines still persisted despite One scheme which has been worked out to a relative success consists of a telephone transmitter provided with a mouthpiece having three small holes. The action of this transmitter is based on the fact that the direct impact of the speakers voice passes through the small holes and operates the displiragm while the seen i wave of the roar of the engine cannot pass through the rose of the engine cannot pass through the holes because the semid waves are not in line with their However, when trans-mitters of that design have been applied to multi-nigmed planes such as the Ne Naval boats they have proved unastis-factory and in the long run they have only pieced satisfactory on smaller amigleengined planes

It has remained for two inventors 1 4 Pridham and P I leasn of San Francisco (sl., to develop a really successful and universally practical transmitter for airplane use At first these inventors like most others at work on the problem attempted to muffle their transmitters so as to exclude engine noise. They made most of their experiments in the testing room of an airplane engine manufacturer where dozens of engines were on a daring move they gave up the transmitter and instead, made it absolutely open or stripped of casings of all kinds. They permitted s to come in contact with the transmitter—at the front and at the back all round so as to allow the sound waves to act equally free on both sides of the disphragm. The result has been the balancing of all extraneous sounds are stin was strike the disphragm with qual-force on both stokes attake the disphragm with qual-force on both stokes he nee neutralizing each other, while the vonce wave strike the disphragm on one side only, temporarily distinguing this balance and therefore affecting the curvait

The latest form of anti-noise transmitter designed by Pridham and Itnaca consists of a displiragm and a transmitter button. The button is a t at an angle with (Continued on page 590)





How the aviator wears the anti-noise transmitter, and the special loud-specking telephone which operates on a new principle

## The Heavens in June, 1919

New Light on the Formation of the Star Systems and the Nebulae

By Prof. Meary Norris Russell, Ph.D.

IT is not always to the achievements of the observer that the actronomes points when he is saled to point out the most interesting him of recent work. At times it is the physicist whose deductions from some mass of ansaty known facts appeal most keeping same it may be the most severely absorbed with the most severely theoretical work if the mathematicism which stands out in prior in care.

A fine example of the letter sert is found in some recent papers by the distinguished I-righth mathematician, Joans one of the leaders of that new selected in the section of the prior of the section 
upon the greater profettine or manhematical and astro-mental plysics of Mr. Jeans present reasorable at one of obvious astronomical importance. What will happen of obvious astronomical majorance. What will happen to a settle unit or quitherium under its own attraction and these to alima keeply as at losse heat by radiation? Thus as no new problem undeed it is the fundamental thought of the old nebular hypotheses of hant and Laplace and has fascinated mean similar working on the problem and many have been the sammptons made regarding the probable and of unproved assumptions we sack a well-canadard theory hased upon regarding magnetic and the second of the second of the probable and the second of the probable well-canadard theory hased upon regarding mathematical deductions from clearly stated postulates the available regerous mathematical deductions from clearly stated postulates the available interature shrinks at one to small proportions for the mathematical resistance of the problem is executing difficult, and even now it remains only partially solved As a usual in such cases the first line of attack was to study the solution. men in a di attaca was tri study ce solution of a smular but much ampler problem—namely the case in which thir rotating mass was composed of some hypothetical homogeneous and incompressible fluid this respond a host of intricate compleasitions even so the mathematical discussion was very far from sample

### How a Whirling Moss of Gas Bal

Here a watering measer than nearly has now been substantially advid by the successive efforts of a long series of distinguished investigators of whom Jonas humanif as most of lew density in slow rotation in form will be his. that of the earth nearly sphermal but flattened at the poles if now the material contracts and grown densor the measer who have been added to the measer of the material contracts and grown densor the mease will rotate more and more received to the statement and the consequence as a districts and its form will rapidly as it shruks and its form will become more and more flattened—the equator remaining an exact circle equator remaining an exact cirric but a service through the poles being of elliptical. As 18 o deck, outline. Finally when the polar diameter. As 110 o deck outline. Finally when the polar diameter. As 110 o deck outline. Finally when the polar diameter. As 110 o deck outline in the polar diameter. As 110 o deck outline in the polar diameter. As 110 o deck outline in the squatorial that figure becomes of the polar diameter. As 110 of deck outline in the polar diameter. As 110 of deck outline in the polar diameter. As 110 of deck outline in the polar diameter. As 110 of deck outline in the polar diameter. As 110 of deck outline in the polar diameter. As 110 of deck outline in the polar diameter. As 110 of deck outline in the polar diameter. As 110 of deck outline in the polar diameter.

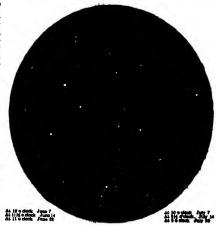
result would be its attling down into a mable figure of another sort an (dippord in which not only the actions through the pairs but also those through the equator would be dilipses. It mathemater) argon the thing has orased it is an (dippoid f resistant Turther shornkap, will cause the dilipse at it is no more and more, longated us till in time, the body is alonged almost the a tigar about three times as I may be roud and the action of the control of the control of the longitude of the control of the control of the foundation of the control of the control of the foundation of the control of the control of the foundation of the control of the control of the control foundation of the control of the control of the control of the figures into which the bit of it change I y my series of graits into which the bit of it change I y my series of er lid modifications

What happens materal is that a furrow firms around With happens nates is that a furrow firms around to experience mass mu it ince out than the other and upday doep not at the part is not out than the other and upday doep not at the part is not that material parts of the parts

compiling quite different happens. As a man robots faster and faster, it commes that that of a thirt double-convex fear, reto axe of symmetry. The edge of the le-rounded, but it finitly becomes there, as other to reach, matter is elected all strong in a manner strikingly similar to that igns are a manner strikingly similar to that igns

section mass) and, as Jonas then shown in the second process and a section of "this statement will precious, as a two, see points of "this statement will precious, as a two, see points of "this statement will precious as a two, see points of the sequence, at which the streaming out of the consping meeted will be busined. It will thevel into space, the reference teating an appealance has the statement of the relation. In other owners, there will not be the statement of the relation in other owners, there will be the statement of the precious and the statement of 
may which stead of the energich to form many theorems to the company to form many theorems to the control like war. As it restaud, the conditional like war as the six restaud, the conditional like war as the six restaud of the main man. At two opposite scales of the boundary the general majoral scapes, and flows out in encorroom spiral scapes, and flows out in encorroom spiral scapes, and flows out in encorroom spiral scapes, and there shared six to stars. The beddent automosper might well know the spiral scapes of these without the standarding consumst hamself on extra-commany a sequence of ideas without the standarding consumers of a definite mathematical formation on which to rest.

this time the process was reprod-tending bridy of a quite different interpolit the foundation, and outs this effected, the brilliant theory almost



At 1014 0 clock June 10
The hours given also in a somer clock time
NIGHT MAY: JUNF AND JULY

pressable gas, and see surfami; not homogeneous but are greater condensed deward their centers. Jean a research workers much the first successful eithers, and the surfame and the first successful eithers, and the first successful eithers. It is analysis which is a surfame and the surfame and the surfame and tradity of a surfame and the surfame proof, for they proceed through the substitution of the principal true of a mining or surfame and the value of the "re-mainter promote through the influence of the surfame of the surfam

A very good case seems on the nature of the presents in E is found that if the gas is rather difficultly commended to a the edge with most passe when they are compressed to a desirably commended to a desirably commenting his a quarter of their owners of which we have a substantial or a desirably comment in the art of propersonable material wall judgate much like as inascentistic mass, and will chapter them appeared to an eightight state, and then presentably repeated into two patchs, as quittiend shows. But if the desirably of the gas is for and it is highly expendently.

# A Stethoscope for the Earth

### The Geophone, Invested for War Service, but Which Gives Promise of Great Industrial Value

By Our Washington Correspondent

"TWEE arts of peace are almost all convertible to the arts of war, much more seldom in it that a structly war beyondies finds even greater uses in pance. But compelions the averaging brought into boing by war's momentum has a rude application when war cause and such speams to be the case with the peopleme, a intensity application of the period of the period, for the purpose of the market warms of the period of the peri

ground maning operations and for locating enemy artiflery.

The microphote we have always with us when it comes to deriving any appearatus for the detering of the growth of the property of the growth of growth of the growth of growth of the o of earth vibre

tion of earth vibrations.
The geophone consists of an iron ring about three and a ball under in diameter within the contor of which as supponded a lead dust, fastened by a single bolt through two mine dusts, one of which cover the top and the other two balls dusts, one of which cover the top and the other two balls of the ring. Two hease any mesons are fastened with botte to the iron ring to kold the inno diskins in place, she top one heaving an opining in int center to which is fastened a rubber tube leading to a sixthe-

the miss dusts, remans compensatively motocoless. There is then a relative motion between the instrument case and the land weight and a compression and revaluation of the six in the instrument takes place. Since the rubber tube leading to the stetch-easing any piece is commanded with this sense.

The threadd his proving these is a gas necessary for method, generally or planeting of the histonian out, you are not to be because of the histonian out, you have been to be the first meant may be housed to the histonian out, and the state of the histonian out, and the state of 
connection with mine resoue work has a number of postularities which particularly fit if for the work it has to do. One of these is the resultine with which the sar recognises which of two sounds in two grophones reaches the auditory acress first. Two suphones are used on for each ear. The impression is that the sound in our are louder than the other, that it is not artist is conducted in conducted to the conducted that it is not artist is conducted. ear is louder than the other, that it is not actual loudness however, is proved by the reactions with which an oper-ator slightly deaf is one aar is at it to orkint sounds. In using two geophones, it is not nly necessary to move them about against the well through which the vibrations are coming, until a point is found where the sounds have

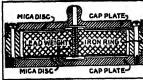


Diagram of goophone showing the stheme of operation

the same intensity to both any. I be direction to which the sound comes, then, will be presented to a line connecting the two instruments. Whicher the sound be in front of or behind the abserver; as matter for further observation, but it results determined.

further observation has its results distributed with such an ameriment in its mean in mine received on the best appreciated by those who have attempted to locate measured numer by robor means Knowing where to dig and in what direction is often three-fourths of the resucce amounts.

The successful is extremely an analysis not only to vibration, but to variations in the vitations so that it is very many to detect the source of its sound whether it is

and a sledge pointing run be heard 1150 feet with nufficient elearness to enable the dre treat to be accur-ately noted. The explosion is an ounce of dynamic transmitted ware surgs, it makes due sound in the geophone for more than two thousand free

geometric for more than two thousand tree.

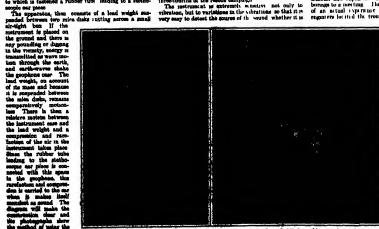
Another surprising feature of the geophone is that the
prising of intercenting rooms gill rise and extress
were to have little effect on the resulting sound. Apparently the earth waves are transputt d in all direction

paracity the earth waves are transmitted in all directions and are pair, it up by the groupons without much it gard to the continuity of insirt rail between it and the source of the vibration. Have a sery important factor in considering the metricum at as an and is miner review or while the groupons will bosset but direction of a source of wave institutes with great accuracy it cannot it instit determine distance. There are the ways of inough the out I vegetate experience will be a supported by the contraction of the distribution of the contraction of the co accuracy how far distant a recognizable s unit may be produced providing in kin as the general character of the earth through which the vibration is coming the other method of course, is to use two sets of graphones and locate the sound source from two directions. Having matter of anthoutu

Matther of arithmetical Another phi norman of the grophone is the readment with which it picks up seamly through the mine cover, although this resimiler is largely inducenced by the state of the air suited in, any great amount of breeze seriously

of the air activa it, any great amount of beere security interfering with its action. The property of the prop

drift and rame supposed to meet had missed Observations were mad in the drift of pounding, in the raise and then ervatious were made in the rank of boundings in the drift engine (re concluded that enginers concluded that the two had mused by about mx feet, and named the direction of each from the other Not willing to trust the pra instrument the mine operators invasted on a survey but when it was made the result was as already determined by the graphone. The matrument is particularly useful in direction datasets to a metal mine rather than motel bearing rock transmore clear-cut mann than coal This is prob-ably because there is some reverberation to the sound from a blow on wood, while on the stone the sound is clean



A gaughose sporter leating a miner working on a coal rib, through 600 foot of intervening rock

pack, hammer, explosion, first, running soler or whatever the same of the actibitives may be An experiment was noted by a Bureau of Mines equines who first may not be a Bureau of Mines equines who first may be desired by 12 disferent stimules and expensivering operations be was able, with east, correctly to name nume of them and accurately to describe the other three sounds abbough they were too unfamiliar to him to allow him to name them.

While not malingfied the grouphone is not marror in its maps, a post orbitizing one of the use of the page of the stimules of the substitution of the same of the

Observations wire made in anyther rase which was being driven up, about six or eight feet distant from a drift. Observations were made in the drift of the sound from the drift in the rase and a point located on the side of the drift behind which the drift in the rase, was apparently operating. The survey mark was two and one-fall feet to the right of this mark. A drill set up and operated at the survey drift in the drift located by the geophones reached the ranes and proved the geophones reached the ranes and proved the geophone to law the survey drift in the drift located by the geophones reached the ranes and proved the geophone observation to have been correct within a few include.



Lute STATIONARY





Middle ELECTRIC MOTOR 80'S & GENERATOR

# Six Great Inventions

How Gargoyle Lubricants cleared the way for their development

SPERM oil and tallow. Lard and suet.
These marked the limits of lubricating less than 60 years ago. Present high speeds were undreamed of.

The engineer swabbed his slow-moving pistons with a brush dipped in tallow. A ridiculously bulky mass of metal was required to produce small horse-power.

In 1866, Hiram B. Everest erected a small still in the back yard of Mathew Ewing in Rochester, N.Y. He believed it was possible to distil the whole body of crude petroleum into kerosene, but found it was impossible to escape a residue which had no commercial use or value.

A study of that residue marked the beginning of the Vacuum Oil Company. Mr. Everest, as president of the Company, lived to see Gargoyle Lubricants known the world over.

For step by step, Gargoyle Lubricants replaced lard, suet, sperm oil and tallow. Today the red Gargoyle is recognized the world over as the symbol of scientific lubrication.

One of the greatest sources of pride to Vacuum Oil men is the part their company has played in quickening the development of useful inventions. Six instances follow.







1880 HIGH SPEED SPINDLE

Early ELECTRIC

1002 STEAM TURBINE

### Stationary Steam Engine Lubrication (Late 70's)

PRIOR to the production of Gargoyle Cylinder Oil 600-W stationary steam engines were lu-bricated with tallow.

Gargoyle Cylinder Oil 600-W was the first successful petroleum . lubricant used for steam engines. Its success was so marked that a large number of imitations soon appeared. But to this day no other cylinder oil is so well adapted to the wide range of steam engine conditions as Gargoyle Cylinder Oil 600-W.

### Automobile Engine Lubrication (1877)

N 1872, Mr. George B. Selden set out to invent a mechanically propelled wagon.

In 1877, with high heart he booked upon his finished engine. Then came a setback. He found that none of the animal or vegetable lubricants then in use would give adequate service on this new kind of internal-combustion engine. So great was the inefficiency of these oils that Mr. Selden practically gave up the idea of perfecting his engine for road service.

Later in the year he learned that the Vacuum Oil Company had prochared a new, clear petroleum lu-bricating oil. He secured a few gallons. The turning point was realized. The problems of oil decomposition and highly offensive exhaust smoke were wiped out. The new oil lubricated his engine with high efficiency. ahead with his work. He went

Mr. Selden paid that oil the fol-

lowing tribute: "It is beyond doubt that the Vacuum Oil Company was the first to make a suitable pure mineral oil that would lubricate a gaso line automobile, and I was the first

Today Gargoyle Mobiloils supply scientifically-correct Inbrication for each make and model of automobile, motor-truck, farm tractor, motorcycle and motor-boat.

### Electric Generator and Motor Lubrication (Middle 80's)

N the middle 80's new designs in Electric Generators and Motors introduced the new speed of 1000 revolutions per minute. This brought up a fresh lubricating problem. The Vacuum Oil Company turned to meet it. Gargoyle Arctic Engine Oil was produced to meet this lubricating need. Although other oil companies later offered oil of almost identical specifications at half the price, users found Gargovle Arctic Engine Oil far more economical.

### High-Speed Spindle Lubrication (1889)

I N the early 80's a relatively thin oil was used for spindle lubrication. The Vacuum Oil Company's engineers, however, be-lieved that the oil was unnecessarily heavy for the work-resulting in an unnecessary waste of power. After a period of experimentation the Vacuum Oil Company produced Gargovle spindle oils. Textile mills reported a marked saving in coal bills on changing to these lubricants—frequently as great as 40%.

Electric Transformers (Estly THE first transformers handled currents of from 2000 to 3000 volts. The higher





the voltage the greater the heat. A petroleum product is here used as an insulating and cooling medium.

This new problem was met when the Vacuum Oil Company, working with the electrical companies, produced for them distinctive grades of Transformer Oils specially adapted for their appliances. Manufacturers were thus enabled to raise the early voltages higher and higher. Today 90,000 volts are possible.

### Steam Turbines (1902-

S TEAM turbines presented two new hibricating problems: (1) They operated at speeds of 1800 to 3600 r. p. in. (2) Water tended to get into the system which, when churned with the oil, formed a sludge. This sludge would often choke the oil pipes

The turbine problem centered about the production of lubricating oil which would not sludge and which would readily separate from water. After extensive research and experiment, this problem was met through the production by the Vacuum Oil Company of three grades of Gargosle D. T. E. Oils.

VAST share of the progress A of mechanical invention duiing the past half century would have been impossible without marked progress in the science of lubration. The contributions of the Vacuum Oil Company during the past 50 years are generously appreciated by power engineers the world over.

The future of invention will doubtless present fresh problems in lubrication. The Va uum Oil Company pledges its resources to meet these requirements as they arise.

The work must go on

# Correct AUTOMOBILE LUBRICATION CHROCK Mobiloils

A grade for each type of motor Gargoyle Mobiloils for engine lubrication are:

Gargoyle Mobiloil "A"
Gargoyle Mobiloil "B"
Gargoyle Mobiloil "E"
Gargoyle Mobiloil Arctic

| ATTEMORIE) S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | *** * * * * * * * * * * * * * * * * *   | T > F Benter                                    | A >>>   CAC - CAC                              | MARK TARE & AND MARK                                                         | >>= >= >> >= >>> >= >= >= >= >= >= >= >=                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | BOOK HAND AND MAN HAND ARMAD A ARMA WARRING A FAM. MANNA ARMA ARMA ARMADIMATIONAL AND AND AND AND AND ARMADINA ARMADIMATER AND | The second of the second second second | TOTAL MARKAN MARKAN AND AND AND AND MARKAN AND AND AND AND AND AND AND AND AND A | - See -                                                 | Day Las                                                     |
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| Anner<br>Value (a.mph)<br>(A.cyc)<br>(r. N. y victore)<br>(t. nom)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | يإشه كير كي محمد إلى م يكر كي الرك      | 143 4444 A A A A A A A A A A A A A A A A        | CONTRACTOR CONTRACTOR CONTRACTOR               | 4 - 6 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 -                                      | MANAGE AS A A CONTRACTOR ASSESSMENT OF THE PERSON OF THE P | Janes Janes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | و ۱۹۶۲ - ۱۹۶۰ و ۱۹۶۶                   | ANARES AND ANA AN                                                                | \$5.588 Er 505565 FF                                    | ARE AREAS AND AREAS AND |
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# lubricants

A grade for each type of service

New York

Kanasa City, Kan. Des Moines

VACUIUM OIL COMPANY and interest for more date of the control of t

# Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

### A Concrete Pit that Saves Money for the Farmer

Will the price of fertiliser going up the farmer is turning to the at di-waste on his farm and finds it a valuable asset formerly little care was taken to get the best results from this fit har When thrown from the stalk at h s ! When thrown from the stillent help and allowed to distribute the plant food contained in it. But the modern farmer binds it is the while to go to the small expense of rating to concrete pairs on his plant is hidd this manure from the still. I arms ly one of the modern farmed by a manure from the still. I arms ly one of the modern studied pairs of the Gridkel was lost cuttinely and that was the liquids was lost cuttinely and that was the liquids and an other preserved for the way to be a still a st use the aboressing device this farmer has a manure conveyor which trans out on a trible to the pit and can be dumped wherever wished by the man in the stall a line saves much time which is a large factor on the farm

### First Aid to the British Motorists

I has remained for the Automobile Association of I ngland to establish a system of first aid stations for its members

slong important routes in fact with this sys-tem installed motoring is bound to become a more or less tame after which is more to the liking of the motorists of the old wall

The first-and system makes use of a large number of tch phone sta-tions metalled along the most important roads The mot rust who comes to graf has but to go to the nearest thephone station and call for aid provided he is a mem-ber of the Automobile Association of Lugland

-to-motorist motorcycle and side car under way The marest first ail station responds by means of motorcycles with side cars win hearry the necessary tools and equipment for making all the accessary repairs. A stretcher is also inchilded in the equipment in the event that the accident is one of personal injury and by strapping the injured motorist and stretcher on top of the side early becomes possible to make good time to the nearest

# An Egg-Mailing Case That Does Not Have to Be Handled With Care

THERE has been no cod to the boxes and crates and packages designed for the transportation of eggs by express or parcel post. Some of them have preved parcel post. Some of them have preved reasonably effective in actual use, but for the greater part the eggs have not

for the greater part the eggs have not had the proper protection when subjected to the roughest handling. Backens of Jacksonwill Fia to design what appears to be a satisfactory coate for the trans-portation of eggs by expose or parcel post. As will be noted in the accompany-to-desired properties of the satisfactory of the safety of the properties of the properties of the safety of the properties of the properties of the safety. post As will be noted in the a company-ing drawing which is more or less self-cyplinatory the crate consists of a corrugated eardboard box and a protective structure of cardboard strips Starting with the bottom, the crate make use of a number of crossed strips of card-board, shown at A Resting on this framework of crossed strips is a piece of "ardboard, B cut with a large number of crossed slite, the intersection of each



A concrete manure pit that prevents an important form waste

pair of slits being above the center of the lattice-work squares. Then comes the arrangement that forms the 12 egg

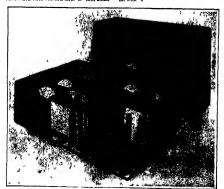
more lattice-work, G, in the top cover The cardboard with crossed slits represents a remarkably resilient surface to the end



England's first-aid-to-motorist men taking care of the injured due to an automobile accident

compariments shaped as shown at C and D surmounted by another piece of rardinard with crossed shits H and some

of the egg while the entire protective arrung ment is quitt capable of absorbing all shot s



This form of crate is said to be available for use in malling eggs without the least danger of breaking them

### Recent Patent Decisions

The appelant, David F. Moore, sued the United States in the Court of the United States in the Court of Lums to recover compensation for the use, without license or lawful right, of a convenient may be been dead of which the from 1993 to 1914 inclusive, his text from 1993 to 1914 inclusive, his text from 1993 to 1914 inclusive, his text of the tool in question, which was adapted to be used as a reeding iron on the decks, sides and bottoms of received where wood caulking is done—that he entared the employment of the Coverment as the employment of the Government as a woodcaulker in a navy yard in March, 1913, and continued therein until July, 1914—that during the month of May, 1914, Mr Moore completed his invention -and that during the hours of his em-ployment by the Government he did not do any work upon his invention, but that do any work upon his invention, but that such work as was performed upon it subsequent to March, 1913, when he satered the government employ, was performed at his home. For the extensive use which the Government had made of the tool be prayed for compensation which had been demanded and refused it is held that where the device was the discovered or invented by a government employee during the time of his simpley-mental properties.

ment or service, applies where he completed his invention during such time, though his work thereon was outside hours of duty, and that hours of duty, and that he cannot recover from the Government dam-ages for the Govern-ments use of his inven-tion—Moore v United States Supreme Court United States

The w a sut by the Union Sulfur Company of the Union Sulfur Company for integer of the An appeal from a distinct court on part of the clummants. Sulfur court on part of the Chimants Sulfur on the Chimants Sulfur on the Chimants Sulfur Sulfur Court on the Chimants Sulfur Sulf

irit cours on part of the claimants Sulfur is unbected to sufficient heat the rook is sulfured to sufficient heat the rook is subjected to sufficient heat the rook is subjected to sufficient heat the suffur of commerce Proor to the American method sulfur numing was carried out in the ordinary way, viz, stripping where the sulfur was near the surface, or shafting where the suffur rock was too deep for stripping. Nime-tenths of the world's supply was sear the surface, or shafting where the sulfur rock was too deep for stripping. Nime-tenths of the world's supply was near the surface, or shafting where the sulfur rock was too deep for stripping. Nime-tenths of the world's supply was nearly supply the world's supply was nearly to supply was nearly to supply the world's supply was nearly from flooding the manse where the old method were employed does not appear, but was later overcome by pumps as appears in the plaintiff, announced a supply supply the plaintiff, announced a supply suppl

# Barked Knuckles

A set of barked knuckles will teach you more about a wrench than a course in mechanics:

A round shouldered nut you can't get a grip on will add to this knowledge more than a year in a factory.

That's the way you learn that one wrench slips and the other grips—that one nicks its sharp edges under pressure while the other holds true-that one wears out and the other endures. Yes, there is all that difference between such simple things as one wrench and another.

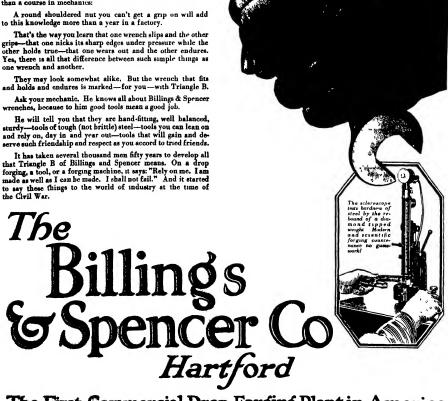
They may look somewhat alike. But the wrench that fits and holds and endures is marked-for you-with Triangle B.

Ask your mechanic. He knows all about Billings & Spencer wrenches, because to him good tools mean a good job.

He will tell you that they are hand-fitting, well balanced, sturdy—tools of tough (not brittle) steel—tools you can lean on and rely on, day in and year out—tools that will gain and deserve such friendship and respect as you accord to tried friends.

It has taken several thousand men fifty years to develop all that Triangle B of Billings and Spencer means. On a drop forging, a tool, or a forging machine, it says: "Rely on me. I am made as well as I can be made. I shall not fail." And it started to say these things to the world of industry at the time of

The



The First Commercial Drop Forging Plant in America

### Recently Patented Inventions

Brief Descriptions of Recently Patented Mechanical and Electrical Desices, Tools, Farm Implements, Etc.

Pertaining to Appeared

OVERALL JACKYL OR WAINL 1 < Vision 1 to object of the investion is to provide an arrangement of the form to the livesticity in the present of the to metally after a limited and investion is to provide an overall just with house for distillations to provide an overall just with house for distillations to provide an overall just with house for distillation of the provided and provided with the restriction and the provided with the contrast of the contrast of the provided and provided with the restriction provides an overall provided and provided with the restriction provides an overall provided and provided with the restriction provides an overall provided and provided with the restriction provides an overall provided and provided with the restriction provides an overall provided and provided with the restriction provides an overall provided and provided with the restriction provides and provided with the restriction and provided with the restriction in the provided provided with the restriction in the provided provided with the restriction in the provided with the restriction in the provided with the restriction in the restriction in the provided with the restriction in the restr

ELECTRIC RECIPROCATING DIVICE G. IONNEON Richmond Va. The Invention is especially applicable to dicti gans riveding devices pumps harmons of An object by to provide a reciprocating a m whose movement is effected by electro magnetic means said means serving to deaw the arm in one direction while the tension device and has a spring it into to carry the arm in the opposite direction at the end of the atroke the tension may be readily controlled being increased or diminished at will

being increased or diminished at will RADI YUTO W R JOANS BOA \* Nummi-ville find. It invention has for its object to provide a devit adapted to utilize electric cur-rent wherein a series of heating tonics is provided, with a suitable is estudy the casing carrying also a tank for water and alseebest wides arranged adjuents in the heating units and dipping into the water begether with an electricity con-related fac by out the water for driving a current of air over the wicks and over the heating units to thoroughly heat and moisten the same

tanougny neat an moment the same and all and a series of parameter all collaborations and an all collaborations and an approximate a supporting frame is provided a device wherein as supporting frame is provided a device wherein a supporting frame is provided a whole mass for a lamping the sit like and wherein the gridding means is carried by a move able support movable toward and from the sickle meansuly and normally surious present proceedings of the significant and the single process of the significant and the single process of the significant and the signif for rotating the grinding moans

for rotating the grinding means IRRIGATING APPARATI N — J L PENN INFORM BOX 01 TORONDA New An object of the incretion is to provide a device which may be used in ronnection with flowing streams and by means of which the water from the arran may be elevated above the banks thereof and delivered to the surrounding country the device also serves as a data than connerving the water and permitting its use at a time when it is needed

### Ot General Inte

EMBIALMERN CHIN REST—E A BRADY 10th and Water Sta Oregon City Ore The object of the invention is to provide a device which will close and hold closed the mouth of the subject. The device comprises a bar having



Intermediate its code a base for engaging the chest of the subject and a standard connected with the base and adjustable longitudinally interest and sections adjustable longitudinally of each other not for connection with the base and the other for engaging the chin of the mubical

VISIBLE AND EXPANSIBLE CARD IN DEX -J A first 205 Broad St New York N Y The main object of the invention is to provide means to enable one to expose to view names or othe indicts contained on the index oards of card indixes. A further objet is to provide means to accomplish the above without consuming any additional space than that now utilized by the common type of card index system now on the market

WIOK HOLDFR—F A McOuras Iola Rass. This invention is especially designed for use in sameture; lamps to support the wick in such manner that it may be easily removed with such manner that I may be easily removed with out the secondity for tous limit the same with the cluster of the same with the relieve that can be adjusted to fit any size of hands, and wherein the remnants of burnt wicks is hader-older or window easily one of the impor-wable being firming hald but in a yielding manner, which being firming hald but in a yielding manner, the provide for use of different sized wicks

Shoemaker Fau Claire Nat Bank Bldg Eau Claire Wis The invention is more particularly intended for use in connection with a combinating intended for the in connection with a community foree drain and trap in whi is the clean out pipe is dispissed transversely to the drain for com-nuous ating there with An object is to provide a plus member having a limited guided move-ment whereby to limit the opening movement of the plus and to provent for complete withdrawal working the missing the provided and the plus working the missing the plus the plus working the plus the plus the plus working the plus the plus the plus working the plus the plus the plus the plus working the plus the plus the plus the plus working the plus the plus the plus the plus the plus working the plus the plus the plus the plus the plus the plus working the plus the plus the plus the plus the plus the plus working the plus working the plus working the plus the p

SROOM HOLDER —II SHOWALTER, Hurley Okla The object of the invention is to provide a device by means of which one may assemble one s own broom needing only the straws and



PERSPECTIVE VIEW OF HOLDER WITH THE PARTY SEPARATED

the holder. The device comprises a handle a sectional clamping ring for emiracing a shaped bundle of broom ourn and a hood shaped to fit the inner end of the shaped bundle and to fit over the clamping ring to cover the same and prevent disongagement of the pins

prevent disongagement of the plas 
(ARHARI ("AN ") A lowar 1602 Commerce 8t Dallas Texas The object of the 
insention is in provide a device of the character 
specified adapted for use on side walls and in 
public parks wheel not on operaths mechanism is 
provided for opening the bid of the can which is 
normally spring, held closed and wherein necess 
is provided for limiting the opening movement 
of the dum:

PLATE LIPTER—S G SINGLETON BOX SIL Burke Idaho The invention has for its object to provide a dwise especially adapted for handling ple plates and the like wherein a handle is pro-vided having means in connection therewith for gripping the edges of the plate the said means being releasable at will and apring econtection to grip the plate

METHOD OF MAKING LACE HAIR-NETS —R SARKOER 239 Fourth Ave New York N Y The invention relates to the process of making in a rapid, uniform and efficient manner ladies lace hair nets and has particular reference to that type of nets characterized by the use of an clastic cord laced into the rim or edge of the set, and having the inherent quality of puckering that portion so as to hold it automatically around

ADJUSTABLE SHADE-ROLLER HANGER The investi



PART OF A WINDOW CARING SHOWING INVESTIGATION



BROKEN AWAY

to provide a device for chilling and drying air to to provide a device for chitting and drying air to fit the all for used is side recome and rooms in which perishable commodities are stored. The device comprises a casing for holding ice a sories of air passauces a fair to take the air into the casing and sucth r fan to withdraw and deliver the

WHILLI PLACING AND PROVING AT-TAILISHMY 4. G and F L Volume 64 Trialist Place New Rochille N 3. Among the principal objects which the invention has in view are to intil a ten to placement of balancing weights on the balancing beam of a weighting sales to above the fraction of the divisional space where a balancing weight member 4 placed in service to prohib the readming of a fractional unit weighting cales and to facilitate the handling of the sam Machines and Mechanical Devices

RADILS AND CONTOUR CUTTING AT--A /BIDLER 161 Clinton Ave Bridgeport Conn The invention has to deal more particu-larly with an attachment for supporting the diamond or carbon point in such a manner that diamond or carbon point in such a manner that any desired contour can be cut in the energy or other guinding wheel the device is so designed that sinuset an infinite variety of adjustments can be obtained for cutting concave convex or compound contours

SAWING MACRINE entities of the hydrological products of the hydrological sight durable machine capable of use in folling or cutting up trees wherein the arrangement is such that the tree may be cut close to the ground to permit the use of agricultural implements over the ground without the necessity of remoder the arrangements. ving the stump

removing the sump
WATER BOX FOR CALENDERING MAGIBNES —W II Is know 47 Levés 98. Look
DOT N.Y. The timention relates to the manufacture of paper its object is to provide a water
facture of paper its object is to provide a water
finish to the paper while the initer passes through
the calendering machine and arranged to prevent
testage of the water emperially in case the calendering
the object of the water opportunity of the collection
of about judy to prefarm matter liable to todge
water supplying strip of ful.

BAILING PRESS S J COATMEN Fallon Nev The invention has for its object to provide a plunger formed from sheet motal, together with means for operating the same which may be



driven from a motor mounted upon the press the motor may be used to propel the frame being connected to rear axis by means of a sprocket chain which connects a sprocket wheel on the rear axis with a sprocket wheel on the shaft.

PREF and with a sprociest wheel on the mant.

PITMAN — Wassersen, B. 275 Buffington;

18 Fall River Mass The invention has for its
object to provide a derive or the chearacter specifled especially adapted for use with booms for
connecting the need with its operating machinaism wherein the pitman is made adjustable to
provide components for vews. In the invention,

mail components for vews. In the invention
metal and when the blooks become worn they
can be remiscand a sight; streams.

can be replaced at slight expense. You consider a superior of the powers 
vice wherein the driving and driven shafts may be connected together to rotate at any desired relative speed between zero and a direct driv-in practice the ratio of the gears is such that the power is first transmitted with a three to one reduction, and from that on a gradual lessening ratio until the transmission is direct

### Prime Movers and Their Ace

Frime Movers and Their Assessories
ROTARY ENGINE —R E LURARY, 80our
Falls 80 Dak The object of the investion is
so provide in an engine a pair of piston supports
each carrying a pair of oppositely arranged



A SECTION OF THE PROTES

pistons mounted to move through a comparons mounted to move through a common annular passage having intake and schaust ports and lemiting means and wherein the pistons of the supports will serve alternately as propelling positions and abutments

GAS AND OIL-SAVING DEVICE --- R
SCOTT Lordburg N M The invention has for
its object to provide a device adapted for use in internal continuation engines, or forcing a certain quantity of celd air into the rear of the crank case to prevent heating the oil and motor by heat from the cylinders and for drawing the air inden with ruel and oil from the front of the crank case through

### Railways and Their A

LOCOMOTIVE-TANK HOSE CONNEC-TION AND STRAINER -- C E Havans. TION AND STRAINER —C E Hay Manchester Ga The object of the invention to provide a connection especially adapted use between a locomotive and its tender, for purpose of coupling tank hose and thorough



removing from the water by straining all scale and the like the connection will permit a large body of water to pass and is so constructed that wen when the strainer is partly choked, there is still room for free passage of water

part room for two passage of water

BRAKE FOR MOTOR VEHICLES—

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be controlled by any missible manne.

We with to call attention to the fact that we are it a postion to render competent services in avery breach of passas or under-need work Our avery breach of passas or under-need work of the competent services in a service for the complex neutron of the subject-marker involved or of the specialized, schemical or seizer of the complex neutron of the subject-marker involved or of the specialized, schemical or seizer of the complex neutron of the subject-marker involved or of the specialized, schemical or seizer of the complex neutron of the specialized schemical or seizer of the complex neutron of the specialized schemical or seizer of the complex neutron of the specialized schemical or seizer of the complex neutron of the specialized schemical schemi

LEGAL NOTICES

## PATENTS

IF YOU HAVE AN INVENTION which you was to patent you can write fully and freely to Munn & Co for advace in regard to the best way of obtaining protection. Please amd abstaches or a model of your is vention and a description of the device, explaining its operation.

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### Patents and Profits uni from page 572)

keen business man will not take the initial risk of purchasing Rocs patent if it were liable to be taken away from him. In rate of purchasing Boc a patent if it were liable to be taken away from him. In that event, as the circule on the vert fully established the third party has not find a purchaser. As he had a winder a find a purchaser is to be a smaller for find a purchaser is to be a smaller for find a purchaser in the manner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner in put so much know patent in like meanner i mg and the public will lose even that chance to purchase any machines at all Without sufficient protection assured by good patents the promoter will not furnish the capatal and enthusiasm necessary t

most the list inventions what rim inventions will not seeve their rewards hear of sont is a state who makes a valuable discovery or invention takes in the patient and decil cates it to the public. The is done with the idea that he is better mag some thing valuable upon the public which the peptic will appreciate and use I do not know of a single touckane; of the sort in which the invention came min general use. There was no interest the premoder hear the precision of the value of the gift, and what people do not value they do not take, the trouble to use United there is a reward to be derived from the effort, no on wall take the trouble and drudgery which such dividend and an invention no matter how mentiones and an invention in matter how mentioness. much such development involves and an invention no matter how meritorious, will not be brought to the attention of the public and the projudies of ages overcome to establish its use.

The Cattrell smake precipitation patents The Cuttrell sancke precipitation patents an apparent exception to these remarks are undeed apparent only. Dr. Cuttrell did not deed in the public has invention in the sance of throwing its maintesture and use open to all II fellowed the much more rational ocurs of putting his patents on the hands of a strong from the patents of the public patents of the public patents of the pa created for the purpose of nothing and exploiting the patents. The public benefit came simply through the provise that this holding corporation must put back all its profits into scientific research. Put an profits into scential research Put an enthusasts: scential research Put an enthusasts: scentar in charge of such a foundation, and of course he will push the invention for all it is worth, so that he will have all the more funds to go on with other inventions.

to after the inventor has produced his invention, he must have protection in the form of good patents which will insure a sufficient reward to induce capital and enterprise to place it in the hands of an enterprise to place it in the hands of an indifferent and prejudeed public. The better the protection afforded by the patent, the surer the inventor is of an adequate reward, and every insulation upon the terms of the monopoly detracts just that much from him chances of re-coving such a reward.

### Oddities of the Trans-Atlantic Flight

Oddities of the Trans-Atlantic Fight
(Continue) from page \$74)

Delgada, not which the big machine
tained without aid No destroyers were
applied on the 300-mile surface primary
til the lang of destross against by the sames
if the wireless in the control of the same of t

# What lubrication means

RUST is the cause of nearly all spring troubles. It begins to forming aggravated by dirt from the read until the laws are bound to gether in one solid mass. Then you have rigid springs. In fact they are little better than a solid piece of spring stock

It takes a powerful impact to compress them



Their rebound is slow and luggish. Thus it is that care and tire- are damaged. You feel every rough spot in the road There is con stant squeaking You stant squeaking You don't know what minute a spring is going to break Freir other bearing on your car is lubricated Springs, though are al-most always negle ted This should not be so bafe ty demands that they be oiled And long car life dem indist, too And tire service, and easy riding

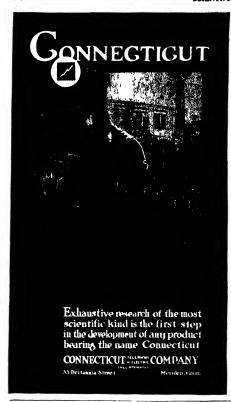
### The GRUS SPRING OILER

puts the oil just where it s needed, and nowhere the It fits all springs. As there are no movable parts, and nothing to wear out, it will outlast any car here it is not an attention peaking, not a morning so were note, it with obtained any Carher in the injustation has the only a carrad from the received to the side of appragathrough felt. By expillarly attraction it goes in he local the apprais haves and traw in the
full length of each. Within a day or two after putting until Cura thir you will see the
rust working out from he twen at the leaves. This will continue smith of the contract o

to keen I him rust oan never form again hen men intesture cannet (get to not used nurnase hen aust the form of oil a restancial by the fitted middle in the fitted middle in the fitted nurst hence there is no waste of oil—an drapping from the springs. The reserved at this top terms a thirty-day supply of oil in air vent teach its wint to fill it full but then vent the oil might overrime before the rear was completely filled. It cannot be tools such leaf of the spring at the twick the amount of oil necessary. The filt extunds from top to bottom on both sides of the spring. It holds an constant radinous a supply off oil to be drawn in as merick at its self-evaluate and automatica, in quirrug no attitution but to fill the reservoir every thirty lays. There is only place to oil each in pring.

Note that the metal frame extends completely around the felt we ping out water and dirt. The oil holes at the top are closed with a fruit in out. Thus the oil reaches the springs close.







Autowline

such a great flight. The machines, staunch | is cordibily invited to come and lises on at and powerful as they were, proved delinate | all times and provisions are shade for in the face of the unusual storms off the spectrum of spectrum of spectrum of spectrum of spectrum of the spectr

two a splanes entered in The Daily Mail trans-Atlantic contest while all other entries are land-type planes. But when the experience of the NC boats is taken into consideration one arrives at the conchains that once a manning sea there is hitle hope of again rising. Hence why bother with a seaplane with all its additional weight and head resistance? The averag airplane with its tanks emptied in the emergency will keep affeat for some length f time so that explains the preporderance of land type planes in what would seem to be a hydro-airplane contest

### A Shooting University

(Continued from page 578) it fun to be on their tummies and shoot now

and then at a far off and tmy square of white with a still timier black spot in its Mayhap the rifle lover may be centured over to see why the trap lover thinks it a good time to break a lot of baked mud pies all over the place with a hotgun

the American Irapshooters Association is installing a battery of its traps and is framing up some big shoots right in the iraming up some oig shoots right in the middle of the grounds where the civilian and the flat-foot which is Armyest for the subr and the multia and regular army teams hold forth with their service rifles. For the first time in history, the same grounds are to see a big clay bird and rifle shoot progressing together A c implete range is being built where the

nat hes with the small bore rifle otherwise the himble 22 of the shooting gallery and the small boy are to be conducted. In the right little tight little isle of England when 35 000 000 people make ranges for the military rifle necessarily hard to obtain hundreds of thousands of the Britishe vers f the sport do all their shooting with the little rifle at ranges up to 100 yards Annually a program of matches for these small bore chaps—not schoolboys nor kids but full grown and sober-minded men -is pulled off at Bisley in conjunction with the fill range matches for the military rifle ud a good lot of prizes are hung up

The idea has been transplanted, and the small bore range on the Caldwell grounds to encourage the movement among the rifle shooters and possible rifle shooters of the country, where even now ranges safe for the military rifle are becoming difficult to in l. The chap skilled with the small to hal The chap skilled with the small rifle needs but a day or two with the big military arm to become a skilled war shot The schoolboy will be encouraged to come to (aldwell nor need anxious mothers have views not his shooting up or being shot up by others. The tutelage of the skilled blue-jacket instructors, who made expert shots out of thousands of their kind, is to be available to every comer to the Caldwell Navy rifle range
A hostess house, and a cordial welcom

in shooting and thus make of him one more unit in the fighting strength of the country, is the bases ides of the National Matches as run by the Navy

The three-miles-square Caldwell range is on the Passic River, land reclaimed by the energetic Navy men, and it is reached via Hudson Tubes to Newark, thereo trolley to Caldwell, and bus to the range The range is so wide open to the public that there's not a latch from which to hang the traditional string During the summer

that there s not a latch from which to hang the traditional string During the summer there will be demonstrations by tanks, machine guns, trench mortars and other material, to be announced more definitely through the newspapers

### The French Problem of Recon-struction —IV (Continued from page \$77)

which has been stopped by the war, as m Lingland it is a case of a new building, new machinery a new work force, often new customers. There is nothing with which to start in most cases save a name and plenty of courage As an metance of what is meant, there is, in the very shadow of Rheims ruined cathedral, a little print of niems runice canteria, a stree print shop it employed, perhaps, before the war 40 or 50 people. The propriety could step to the door and see the facede of the cathedral and if he were religiously inclined be inside its portals in 30 seconds; walk. Today there is no roof to the building and if a second story existed there is nothing in the walls to indicate the fact. Whatever was higher than the door has fallen on on the presses. Three r hnotype machines are buried to Three ruined keyboards in brick and stone Every wheel is a mass of rust Any one can have the lot who wants it, an ironmonger wouldn't give a franc for the entire outfit. wouldn't give a franc for the entire outlet.
And this is one of thousands of cases.
That printer must get himself a building,
presses, linotypes, cases, types, paper,
business workmen, before he can begin
to take his place in the industrial establishment again

This central reconstitution group is only advisory in character and can do no trading according to French law So rt has formed a body which can trade, which the formed to body which can trade, which can be the imposeng name of the Comptour Cestral d Achaies Industrials pour les Regions Envahies This body has a singal fund of a couple of hundred thousand dollars to its credit but can get all it needs up to the resources of the parent advisory body, as fast as that body walls. It functions by buying machinery and stocks may pay for them is eash, at the saving obtained by the large powers and functions of the trading body, or who can kew them charged agazent the eventual meanity to be reconved 50 far some 12 millions of charged against the eventual indemnity to be received. So far some 12 millions of and orders for 40 millions more are in a state of preparation, principally for the re-constitution of coal mines, power plants for electric power, machine tools, etc. Textile A hostess house, and a cordial velocome is fit contribution for the facies who feel in the contribution for the facient facient for the facient facien sotric power, machine to





The Economy Safety



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How long it will all take only the future can say There are so many problems all to be tackled at once and I rance is not a country nor are the I rench a people apcountry nor are the Irrich a people ap-to find at once the most efficient and the quickest way. France perhaps more than I ngland elings to the old idea. The French are thrifty to the point of absurdity to the average French mind to throw away. is to waste even if what is thrown away is in itself wasteful to use. Much time is going to be wasted on fruitless attempts to repair and remake what is far better acrapped

But it is not for the onleaker to criticize Indeed after having wandered through these death like regions and som the at solute migation of civilization the complete destruction and the magnitude of the problem one is not t inpted to criticize On a feels indeed that results would conce quicker were ther perhaps less fear of the loss of trade which would come hy admitting foreign products at once. What I rance needs is material tools and trans prainten actum is material tools and trains portation it a keep any of it away with regulation tariff or import duty is apparently a mustak. But hi french know their own business best doubtess, and that your apparently ruined French peasant stort with the properties of the properti keeper manufacturer miner of producer

In the little town of Belleau at the foot of the slope winch rises to Belleau Wood just west of Chateau Thierry has come back one lonely juhabitant Belleau had but a dozen houses and they are now but walls. But the lonely ministrant is not dainted. With hammer and saw he is daunted With hammer and saw hi is industri usly patching a piece of a roof for a piece of a house and he whistles while he works. And that is after all the spirit of france today and the answer to all cratics who find her reconstruction program somewhat small for the task and her program very slow Whatever her nor how they may be criticaed from an American standpoint she has the stout heart and in time and with American machiner, some foreign tredit and the lightheartedness which comes from a beaten Hun and Alsace and Lorrame home onto more she is sure to conquer in the end and heal her wound mend her sars and he over more than the sure to conquer the end and heal her wound mend her sars and her wound mend her wound her wound mend her wound mend her wound stars and be once more what she has for so many centuries taken such pride in being La Belle France

And having seen the back-saw mark of the Hun across this land and the smile ou the face of his victims having listened both to Paris frying out again to sing and the lonely victim in Belleau town whistling at his hopeless task of remaking a home one American observer at least is quite quite willing to lift his hat and cry with all se la Francel

O THE TRADE-

### Some Startling Electrical Phenomena with New Form of Vacuum Tube (Continued from page 679)

nickel there is an increase in resistance only when the nickel is made positive but

not when it is negative

It is known that glass at or near its It is known that glass at or near its melting point becomes a good conductor. This property of becoming strongly con-ductive when heated to a semi-fluid state is probably shared by all other so-called ctries, but it is obvious that it would be absolutely impossible to operate a vacuum tube at such a temperature. In glass will so the tube would collapse at about 425 degrees C. The glass will not however attain red heat until heated to about 600 degrees C. Electroly tie conduction of glass in observed at far lower temperatures than those. In actual operation, the temperatures of this electron pressure of the temperature of this electron. The turel offset both asserts and retards the operation of the detector. It has been found that while conduction is taking place in the glass the products of decommentions in the glass the products of decommention.

found that white conduction is making piaco in the glass the products of decomposition are deposited on the electrodes. The second effect is really part of this third effect, it being probably a deposit or an emission of some of the products of de-



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### The Design and Construction of Induction Coils

The wife of the first part of

Scientific American Publishing Co. Woolworth Building New York City



composition at the anode which causes its surface to become non-conductive In the operation of one of these tubes as a detectur some of the products of decomposi the tube and are deposited on the cooler portions of the tube. This action is tion are emitted from the mast walls of This section is of a meherd unture as it would probably aid

might be emitted during the operation

After exhaustive research work Mr

Donle developed the tube to its present forms which are shown in the accompanying illustrations Here we have in each case a hlament surrounded by a controlling elecwithin an evacuated tube the terior walls of the tube being coated with a metally deposit. The state characteristic curve of these two forms shows that there is practically no variation for various tubes. The tube in effect is a vacuum, surrem led by an electrolyte and it is probable that must of its piculiar char ire due in a large moisure te electrolyte whom in the glass walls

The results obtained with these tubes a pasi Rici s india oscillating detectors have be a pute ramarkable according to persus who have used them. As a simple detector the response is reported to be great r than that which is of fained with any of the usual types of vacuum tubes any ctill usual types if vacinum times, but y i detector cselliting on spark signals its promining is externel; grativing the strong holosogids heing many times greater that that given by most tul s in general use

most fill sin general use.

The construction of Mr. Donles tube is sin photy itself. As will be noted from one of the accompanying illustrations it consists of a stem which is shown at A. and with contains a diminutive harpin shiftment while at B the control con-sisting I estuall spiral is placed over and about the filament and connected with the procetn as a hight the filament and then procet in set light the bilament and then I listed of over a hundred found-speaking bound rithe cuttoff in the pulsation of in sufficient pertential elevate it and the local peaking the processor from the cuttoff and the first peaking the processor from an international processor from more realistic porter of frost form gas hefor associably. The second of the processor from the processor fr to f in the plate.

Mr Donk states that the almement of

the filament and control is not at all critical it being only necessary to see to it that the filament is placed as near the eenter of the control as possible. The nter of the control as possible. The postil apparently makes no unnerence in the peration as long as the control doos not tuch the filament. He structural ulvartages of the new tulk are quite obvious when compared with standard tulus lastead of having an area of metal mede the tube of several square continuous there is hardly as many square milli-meters. In order that the tube he held at a fairly constant temperature during operation an outer shell of glass is slipped over the tubes proper when it is comented into its socket. This shell is provided with two small holes near its base which prevent the temperature from becoming excessive With this shell removed the operation is quite satisfactory if there is no The shell protects the tube from draughts and mechanical injury

The uniform operation of the Donle tubes is most remarkable. It was at first expected that commercial variations in the glass thickness and so on, would materially affect the operation. Such, however, is not affect the operation Such, however, is not the case and made under ordinary conthe case and made under ordinary con-ditions they run entirely uniform, so much so in fact, that tubes may be inter-changed in any circuit without the ne-cessity of readjustment. In short, the tube described possesses not only certain superior electrical characteristics, but 19 readily and heaply produced in any quantity.

# A Successful Type of Anti-Noise Trans-mitter and Loud-Speaking Telephone

(Constitued from page 579)

relation to the disphragm, in order to relation to the disphragm, in order to prevent it from being held horisontally at any time. Other transmitters, when used by airmen, are apt to be held horisontally when looking over the side of the mirplane, with the result that the carbon granules fall away from the front member of the button and the transmitter becomes in-onerative. With the button at an angle, operative however, it is impossible to bring it into the horizontal position unintentionally The transmitter is held in a perforated casing which permits all sounds to reach the front and back of the diaphragm, while a push button permits the transmitter

to be cut into circuit when desired Aside from the anti-noise transmittee which it is interesting to note, is employed on the Navy NC planes and other multiple-engued machines the same inventors have developed a loud-speaking telephone of novel design instead of the usual heavy disphragin attracted by a pair of electro-magnets they have made use of a pair of powerful electromagnets with right p le-meces between which vibrates a coil the coil is fastened to the diaphragin by means of a wire and moves up and down across the lim's of the magnetic flux. The electromagnets are connected in circuit with a powerful storage battery while the telephone current is passed through the fine winding of the coil

inn's midning of the coil
Highly interesting results have been
illighly interesting results delectro
dynamic type of loud-speaking receiver
ludecd, sounds have been transmitted over
datanees of several mides and during on
of the tests the sound wavis were heard
some sever mides viewy President Wil
son's victory Loan message was read by
Latti H I Mettaff a ratio offer, while Hying over Washington, D ( at an al titude of 2 600 feet and was distinctly glass or its thin photod in a place on the state of the photod in a place on the state of the state of the state of 2000 feet and was destinedly rin or 14 means of a vacuum pump. The mas of the inner structure is set of them to stall that it is a very sample that it is a very sample matter i level to parform it be usual. Instead of over a hundred loud-speaking

> and on many of the airplanes of the Frenchi and British armies. The instrument is now being installed on the vessels of the United States Shipping Board And with to the the apparatus simpling Board And with the apparatus released for commercial purposes their should be some interesting rent (doos speaking The new desk telephone emperatus in telephone simplified by the commercial production of the commercial production of the commercial purposes their strength of the commercial purposes the commercia speaking The new desk telephone em-ploying the anti-noise transmitter has a receiver for each car and looks like a physician a stethoscope greatly enlarged, while the transmitter has the appearance of a young collender fitting closely to the mouth. The inventors assert that the only proper way to use a telephone is to listen through both ears. With this deak telephone set, the arcuit is automate ally made by removing the hand set from the double hook, and broken by restoring the instrument to place

### The Heavens in June, 1919

(Continued from page 580)

of the equator, and remains visible until after 11 P M by the clock all through the ator, and remains visible until

Mars is a morning star in Faurus, but will be very hard to see, even at the end of the month, as he rises only an hour earlier than the sun

Jupiter is an evening star in Gemini and now sets before Venus, at about 11 P M. on the 1st and 9 30 on the 30th.

Saturn again is an evening star, in Leo, and sets a little after midnight in the middle of the month

Uranus is in Aquarius. He crosses the meridian at 5.30 A. M. on the 18th, and is



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### BOOKS

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therefore, observable before the dawn

egins Neptune is in (ancer and an evening He is in conjunction with Venus on the 14th

The moon is in her first quarter at s A M on the 5th full at noon on the 13th in her last quarter at 2 A M on the 21st and new at 1P M on the 27th. She is nearest the earth on the 25th and farthest away on the 10th. As she traverses het track round the zother she comes into conjunction with lupiter and Venus on the lst, Neptune on the 2d Saturn on the 3d Uranus on the 19th Mars on the 26th Jupiter and Mercury on the 29th and Neptune on the 30th

Princeton University Observatory May 17th 1919

### A Stethoscope for the Earth

(C mithe aid fr ne page 581)

Mining engineers believe the geophone will be useful in preventing prejdents from explosions when breaking through this yet remains to be tested but it is certain within several hundred feet it prefectly possible to destinguish the dif-ference between tumping a charge using a pick bitting with a mallet or a sledge or almost an other sound. It is difficult to describe this ability of the bittle suith stethoscope to make sounds recognizable but it is remarked by all who use the instrument for the first time

Observations were made recently of a mine his burning from twenty to forty feet below the surface. A low rumbling noise could be heard as if air were being drawn in long crevices and accasionally sounds could be heard from the snapping and failing of paces of coal or rock well as can be determined the fire area was accurately located but owing to the fact that the are could not be appre from the moude the data was not checked absolutely It is interesting to note that similar sounds were heard from only one point on the meide of the mine and that that point was the one nearest the area alocated on the surface

It has been found also by the Bureau of Mines engineers that the instruments can be employed quite advantageously in locating knocks in automobile valves and cylinders For this purpose it is well to that can be easily inserted in and around the machinery by this manner not only can a troublesome cylinder be located but the trouble area in the cylinder can also

After the maestigative work has been completed a course of metruction in the use of the geophones will be developed and recommendations will be made as to what procedure it will be best for a resourer to as what had best be done by an entombed mmer

### The Current Supplement

Till principle or hypothesis of relativity which has been under discussion for 25 years or more is now being developed into a theory of broad bearings. Those recent developments make it all the more more tant that we stop here to review both and new hypotheses in this field, and our readers will be glad to have before them the clear discussion on Physical Relativity which the Scientific American Superi MENT, No 2265 for May 31st 1919 offers Another interesting survey and review is presented by the article discuss review is presented by the article discussing The Influence of Astronomy on Human Thought, wherein it is brought out how important astronomical research has been in shaping our ideas of space and of time during the history of human thought Our iron-makers and acid manufacturers will be more interested in the article, Acidresisting fron, which reviews human efforts resuming 1 ros, which reviews auman entoris to produce a resistant iron which shall take the place of the expensive rarer metals possessing this property. The steady increase in demand for economical fuels will attract attention to the work of the



Circumstances may compel you to accept a "readymade" building instead of one designed to fit your needs But that does not compel you to accept substitute sash as well! Your factory does not shut down when it rains why should you shut down the air supply by using monitor sash which must be closed with every shower?

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# Behind the Motion-Picture Screen

THE mysteries of the Movies are bared at last! It has remained for undertake the task of answering the thousand and-one questions constantly being asked by screen fans and aspirants to screen careers, in his book striked Behind the Motion Picture Screen

Among the subplosts covered in

and His Work Motion Picture Acting Motion Picture Cameras and How They Work The Camera-man In the Land of Make Believe Studios Mob Stuff Tricks of the Screen Laboratory Work Pictures



in Natural Colors. in Natural Colors. Microscopic Subjects Talking
Pictures Animated Cartoons and Sculpture
Motion Pictures in Ods
Pields Motion Pictures
in the Home and Business.
Present Status and the
Present Motion Pictures.

This book has been written in a simple interesting and instructive style it is not stehnical yet it cover all phases of the screen art in an accurate and to the state of the screen art in an accurate and on the subject—over 900 pages. Indeed every right-hand page is an operate page severy left hand a corresponding text page? It is something entirely new hook making. Behind the Motion-Picture Secreen consists 459 pages and over 900 illustrations printed on the finest coated paper and bound in an extensive cloth cover measuring 540 pb/1, inches P 176-53 58 set) Pooling Extra.

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ers, and another interesting collection of phot graphs illustrates Some Nature Indusphot to ruhe illustrates Some Natus Indus-rises of German Camerono A long sum-mary of several papers presents the In-festers f Assahm on Mathematical Physics, and s long unillustrated discussion on tutting lubracants presents the results of a Britals survey of this field designed to bring ut known but lattle realized feats bring at known but little realised facts regard k their use Photographers will welcon the suggestions and experience embel 1 in the two papers, Coering Pouc i Illuminating Pouce of Lenses and P to of the Illuminating se Enlarging and r to of the luminosis in managing and r rection. Shorter articles or abstracts include concrete as a Chemical from they get single Material Artificial Great made from they for a concrete ship. Determinating the temperaturity of bolids of High Iris res The Suzza of Cells. Philosophy and hi ritualism

### Recent Patent Decisions

(Continued from page 584)

as a means of bring the liquefied sulfur to the surface. All of these patents in contenti in were granted to Francia, atter-pate is covering substantially the same ideas had been granted to Franch and the later 1 items do not show sufficient in venti 1 in view of the earlier patents to make them valid —Union Sulfur (o v Fre 1 it Teros Co U S C C A of Del

ih invention hereus relates to mechanical n sucal instruments such as the pianola and the piano-player wherein mumoal notes and the piano-player wherein muscal notes are untimatefully sounded by pneumatic medianism actuated by a travelling sheet of priorated paper. The state of the art records the advance of a mechanical musical instrument. It contained first mean's for the mechanical sounding of musical notes governed in their production and duration by the other mechanical mesus of a travelling sheet of perforsted mesus of a travelling sheet of perforsted partire, efficies to the sounder thus mechanical methods to the sounder thus mechanical methods. artisii effects to the sounds thus mechanically produced by controlling their speed and volume. The latter means embrased a number of parts termed controllers so that the production was musical according to the skill with which the performer moved the controllers. When Mr. Young the nattender entered the set some received. moved the controllers When Mr young the patentee entered the art some museus knowledge and skill were required by the performer to render artistically a museud conjustion in the Young patent nothing is left to the skill or interpretation of ing is left to the skill or interpretation or the performer in supplying musical effects when a certain line changes its position and direction. The performer does not have to raid it. The purpose of the invention is t facilitate the shading of music so that to radit. The purpose of the invention makes and it facilitate the shading of muse so that it a facilitate the shading of muse so that the facility of the propose of the meaning of the propose of the p

Submarine Defense Association in devising sainm and extending one in the submarine Defense and their common the subject on the subject on this issue involved in this. Submarine Submarine describes the extend attention of all fuel covering a thing which, while long-submarine Defense and Submarine Cunninghom Piano Co v U S C C A of Panna.

Commendees Pieno Co v Assistant Co V S CC A of Pienosa.

The mechanism at issue embraces an automatac devose for existing a flowing stream of molten pieses, means for discharging the same, and means for of inflicting the molten for the control of tarougn a noise in the obttom of the turnace and it flows continuously as soon as the plug is withdrawn to allow the molten glass to escape into the molts. In defendant a machine there is no hole in the bettern of the furnace. The molten glass is held the turnace and cannot escape until propelled over the lip of the dam by means of a paddle because the crest of the spout is above the normal level of the motion glass in the tank. It is held that the Brook glass in the tank It is held that the Driver patent is not infringed by the patent of the defendant, having a distinctly different principle of operation—Brook Glass Cov Hartford Passesount Co U S D. C. of

The evidence in this case shows that Meszro Milton & Kana were plaintiff a employees Milton was Kanad's subpersormance of the control of the

# Chesterfield

"Good him by land"

obe finest TURKISH
observes-blended
are be copied.



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The Annual

# Roll Call

# of WHITE TRUCK FLEETS

ACCORDING to its annual custom, The White Company is now publishing its Roll Call of fleet installations (ten trucks or more) in national magazines and metropolitan newspapers.

Year after year this Roll Call grows. It is something more than a list of well-known concerns owning ten or more White Trucks. It represents a yearly progress in added trucks per owner—the most extensive growth of individual fleets ever published by a truck maker.

The rate of growth of the installations which comprise ten trucks or more is shown in the following summary for each year:

1910...54 1912...495 1914 .1704 1916...5147 1911...194 1918...1001 1915...2601 1917 .7436 TODAY 9227

There are now 2,774 White fleets in active service, totaling 33,139 trucks, exclusive of all single truck installations.

A copy of the 1919 Roll Call will be sent to anyone interested upon request

THE WHITE COMPANY

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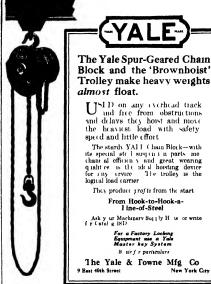
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HFRE are a good many men in a rust as to motoring possibilities

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They don t know what they are missing or what it is costing them to use a compromise car

They never will know until they get their hands on the steering wheel of a Packard Twin Six, feel its sensitive response its pick up and getaway its pep and go its case of control its absolute smoothness and accuracy

The Twin Six is a remarkable car to handle in traffic. It is a revelation to the man who now grands and jerks along in congested city streets.

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One prominent industrial men says The Pankard has added at least three hours to my potential business day

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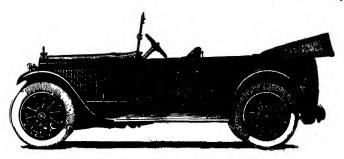
Another The Peckard is one shining example of a meter out

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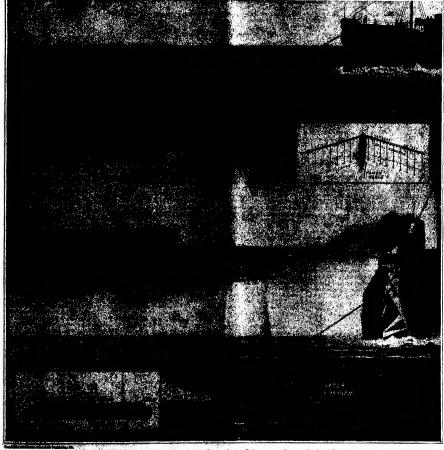
# SCIENTIFIC AMERICAN

# THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

AOTAMP CXX

NEW YORK, JUNE 7, 1919

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American "mystery" ships and their equipment for combating U-beats, torpodoes, and mines (See page 800)

# SCIENTIFIC AMERICAN

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The object of this journal is 1 seem d accurately and livedly the latest ventife me I need and industrial means of the day. In 1 veckly 1 and 112 in a position to annume visit of they developments before they are published visuality.

The Editor is glid to have submitted to him tensly articles with the fittes columns especially when such articles are accompanied by photographs

#### Lessons of the Trans-Atlantic Flight

NI wook as a long lapse undeed in reporting the new of the trans Atlantic fight. In last, week a seaso we were last uting the loss of two brave meal hawler and freew who see not from New-foundand in their unalge-engined Sopwith biplane and who were not heard from for several days, thus giving every reason to bulieve that they had mot with death somewhere in the tractices Atlantic. But before the last sause could even reach nutrendeer news come from Section 1 to the second of the second o

After all the Sopsith machine performed well according to Hawker a story. It covered well over half the datance and was in the air about 13 lours before it was forced to come down because of eagust trouble It appears that the (trulation system became choiced and the temperature of the water row to the busing point. Still despite the great heat of the evhaders the eight continuous despitements of the evhaders the men algebraic on the sater in the path of the 'Mary, which roked them in.

Somehow or other the Sopwith a fight even if unsuccessful har raised the stuck of the ample sugmed plans to par or better. For it is now generally believed by dying men that Hawker and Criv's would have mind, the crossing had it not been for the dougning of the circulation system. Bo those why have been lagaring on using single-england planes are again in high planes and draum-

Whetive may happen in the trains Atlantic flight contrat between now and the next few weeks the fact remains that the is little of someweard whe in any of the attempts. It is necessful crossing of our Nayry's NeX eliberates better than may other attempt the magnitude of the difficulties. With moneyous warships stretched out along the curse of the X-machines and with the very finest ejaponent possible the Nayry attempt has doed by i that the chances at making the flight are in the p-p-ation of m- and of three. First the Nayry attempt has been set in adversible do adverse weather conditions. In the observable of the matter. Overeswith an exposure is the Atlantic Orean there are few days throughout the view when weather conditions are ideal for a flight over 1000 index. Adverse weather must always be considered in any trains Atlantia attantic.

As for the machines, the land type of plane is strange as it may seen the best for the attempt. In fact of all the machines entered in the londer blondy Most content only two are seeplates up till the present writing. As the constructors have viewed it and as the experiments of the Nr I and Nr S have proved a machine no matter how sturchly built at may be has little chance of resuming the fluctuation of the Nr I are the fluctuation of the force of the fluctuation o

So it comes right down to a matter of using a land plane, which is lighter and makes a greater speed than a seaplant of quivalent expandity and running the chance of getting across without coming down. In a word, the trans Atlanti flight must be no big jump

## The Naughtiness of Nations

ARLCENTLY published report of the Census Burrau acts forth state rather curious figures as regards the number of prison commitments and of juvenile delanquests and an ing the the foreign-born white population of the United States.

The has a headed by Meve — with 2 1 par cent, flaured on the Measura population huming in the United Nixtas Next in order come the Irods with 2 per cent and the Stotch with 12 per cent. Nustries follows with 0 82 per cent. Figliand and Wake-sh w 0.77 per cent. Fingland and Wake-sh w 0.77 per cent. Fingland with 0 11 per cent. Then we colding the list consequence of the per cent. The second of the Measura with 0.81 per cent. It also use the 1 per cent. It also use the 1 per cent. It also use of the 1 per cent. It also use of the 1 per cent. It also use of the 1 per cent. It also use a mong the shift of contributors, giving 0.59 per cent.

There are the figures 11 v bring some surprises and also some extreme contrasts. Thus the Irish were committed about five time, or frequently as the Germans and the Scotch twice her fit in as the Itahans.

What construction is to be laid upon these facts?
What conclusions shall we draw from them?

The only conclusion as which in the feels reasonably sure is that the figures can it be used as a measure of oil gift by the feel of a measure of oil gift by the feel of a measure of oil gift by the feel of the

In any case numerous fit it is uter and influence the statistical figures which is if rith only the resultant of many forces acting together. Only a complete analysis showing all the contributing a risk wind enable us to construe intelligently the sit isni il late.

In the first place the nature of the offense must be taken into consideration. It has for metance three-fourths of the commitments in one the interest of the commitments in one the interest of the loss serious offense. I thinke miss and district that the same head the Italians who showed up favorably in the retural contributed loss than a third of all their offense. On the other hand the proportion of commitments for sealing was larger among Italian offenders than for incommitments for sealing was presented by the contribution of the contri

A factor which also product by hocal maring on the statestal about a tile bottomit in of each mation among the rural and the of us population. For instances of the Irade-born N17 present were living in urban communities, while the excrepaoning factor for Germans was 69 7 per cent on for introce of Domnark N3. But on the other hand the Mexense who have the highest proportion of communities have also the smallest proportion buying firetties and Russan for whom the percentage living in edities in Russan for whom the percentage living in edities in Russan for whom the percentage living in edities in Russan for whom the

# Another Field for Patent Relief

I'll granting of a patent is on both adoe a close cue of an agreement with consideration. In consediration of his having created azmething nw the Giovernment grants the inventor exclusive rights over the thing creat of in consideration of this grant the inventor agrees that his rights shall hold for a limited period sides which his unvention shall be thrown open to the free use of all. To make this limitation offset who, his unvention shall be thrown open to the free use of all. To make this limitation offset who, he was a full disclosure of his invention of the present of the present of the present of the second or the seco

Now the Government requires no protection against the inventor for the latter has no power to oppress the

public. The Covernment, so the other hand, has whitey power to oppose to inventor to can, if is will, seen abrogate the whole patent system and confineds all inventions that in spite of urging from certain pursues it does not do this is simply because a majority recognitism and a course to be uriginal and, in the long run, unpostable. But ma a thousand other ways the Government through its legislative and administrative bodies, has power to harnes the inventor. Moreover, the state does not of stell, possees the will not do do this. Procedure which unvolve the dealing out of injustice arms autimative sub or accordantly, they cannot no be set saide but can be negatived only after a great deal of effort be of behoves us to watch with the utmost eart the progress of patent law and patent procedure,

Now the faventor wants to hold be invention under he central as long as he can, the public wants the right to use it freely as soon as possible. As the best compromise hetween these conflicting interests it is decread that I? varies as that life of a patient is just long enough to enable the inventor to build up a demand and a means of supply and their to enjoy a period of profitable monopoly. This is recognised as a fair arrangement for all concerned.

heveral decades ago a certain inventor inventor an machine for cutting venera 10 times as thin as they had over before been cut. He spent a number of years in developing this machine to the point where a patent was in order, and several more in establishing it in the market. At this psychological moment solid furniture came is and within an increability brief interval there were no veneers being made. The veneer came back, but not until after the expiration of this patent.

In the case cited the inventor was merely unfortunate What would have been his state of much, however, if the Government, at the moment when his investment of time and money in his patient was at a maximum had (in good faith) sought to develop the lumber industry by a law forbidding the manufesture of any save send furnitura? Would he not have had a grevance? Would he have been in any way isseaned by the knowledge that the law was intended to serve a good out?

Right now there is a large hody of American inventors in much the position here suggested. During the progress of the war materials had to be diverted from non-secrital uses to essential industries. This was eminently right and proper our only bisaness, last year, was to beat the common enemy. But consider the feelings of a man holding, a paint on newdl asy fire-seepase, or a superior grade of fancy paper or a mechanical toy of metal, a prietting reall under way toward profitsable reploitation when the war rame along and cut off his supply of raw materials by gow rement defect or even made it temporarily tilesal to menufacture has article under the mediance of the median of the median profits of the median profits of the profits of the median profits of the me

This man will feel much worse than the fellow who has been put out of business by the laws of supply and demand or by pure luck He will feel that the Government has robbed him of two years of the term during which it had agreed to let him enjoy the exclusive rights in his invention. He does not claim that this should not have been done, he realizes that it had to be done But he does claim that reparation is possible, in a manuer so simple and so lacking in cost or injury to anybody else, that there is no excuse for not making it. Give his back his two years, he asks, add them to the term of his patent, so that it will expire in 1925 instead of 1923 He wants no recompense for the general disruption of his business, for this was a hazard of war that all suffeced in common But he does think that when the Government found it necessary practically to suspend the opera tion of his patent for two years, the least that sould be done for him would be to give him back those two years

There is a large number of patents in the building trades as well as in a wide variety of non-ceneratial industries employing essential materials, which were thus readered integerative during our praticipation is the large fight. Much has been said about releving patenties of the defaults improsed upon them by the war. We believe that the group we have mentioned in quite as deserving of consideration It is not a question of extending all patents luddsorminisately for two years, but simply those whose holders one show that they large singlened the loss outlined. It seems to us that the aboute singulated the contract of the contract

#### **Charledon**

Physical Characteristics of X-Ray Screen,—The qualities of acreens used for X-ray work are now of membership intenset, owns to the many applications of X-rays, and some interesting notes on this subject are other-british Review. The author discusses in some detail the fracescent effect centric in various substances existent transports of the purpose of spectrographs are also presented showing the effect of higher pressure on the Gooding to the—which gives rise to greater exclaim power but somewhat im

Electrically-Heated Quilts have been need with good effect in Bethal hospitals Those quits are arranged with highly farible vestions were, which is in troduced in two mulated layers of fabric the tune, which is surrounded by heat-conducting material so as to fasilitate conveyance of hast to the patient. Over its leastly the quilt were used in order to supply warnh to consumptive patients, alsoping out-of-doors, and provide a great advance over the tune-themed hot-waker bottle More recently they have been used in fewer wards etc to promote perspiration. It is stated that a bed tem persuite of 00 degrees can be attained in less than half an hour and maintained continuously thereafte.

Balantum Production in Germany.—According to the Sideshess, scientum, which is a large by-product in the copper industry, could easily be masular-tured in much larger quantities if there were sufficient demand, and now uses for this material should be diligently senglet for In 1914, the output in Germany slones was about 30,000 pounds. The material at present is used about 30,000 pounds. The material at present is used mainly as a clearing agent in the glass industry, and it has sense applications in medianea and in connection with the same applications in medianea and in connection with extran photographic materials it has also been used, as a substitute for sulfur, for vulcanuage rubber. Its unique property of alteration in electric resistance under the action of light should lead to promising applications in the future.

Hiscitric Honters for Rullroad Tractics.—During the heavy movefull hast winter a somewhat novel from of destre heaver was deviated for use on certain British adlways for keeping the possite and switches free from move and or. The heaters consisted of a length of restriction were wound on a povedant tube. This lister was contended between insulating dakes and placed in lengths of 3½-inch gas pips. These tubes, continues Referencel Review, were about 11; but in lengths, and these concernant rough and ready beaters were completed to lengths of ordinary rubber-covered were said aid under the points to be protected. As soon as the current was switched on the soon as the current was switched on the soon as the current was switched on the soon as the current was been in use on radroads in this country for soons years, being brought out for service when the soon begins to fail. The heaters take 11 and papers at about 30 volts and for ordinary work they are used three an serves serves a 110-volt i routs. It has been from deconsary to use 18 heaters for the turn-outs, and these sample but efficient and the service when the soon begins to the greater of the turn-outs, and these sample but efficient applicances have been employed in large numbers under pipe rune, near ageal mechanism and in the vicusity of the general got for the turn-outs pipe.

Wireless Amsteurs are again turning to their favorits hobby in large numbers. But it is barch the assateur varies of former days, when a rardboard tube a few courses of magnets wire, some hunding ports and plesses of word, and general dates to No., redeed I The assateur of today, maint apparatus which as quite comparable of today maint apparatus which as quite comparable who maint apparatus which as the conference of the property of these notes happened to be in an electrical structural A missellaneous collection of wireless apparatus when the rendervote of New York wireless practical by an accounter, and a saleman explaned that is man pre-sent apparatus which was being sold out at meaning point, and a serve growth and a location, which would here bleed the price of any grant age. The selection, mainty the intervented leaf, of this unstateur, apparatushed. "Would you like to key tight form-owner drawing." I consider what stuff long age I was leaf, the sent property of the pro

#### Galance

Amether Expedition to the Mount Katmal Ragion of Alaska, under the leadership of Prof 1 orags has been sent north by the National Seographic Society, and was reported to have reached Kulinki Island the latter part of April. The party includes cleamates a pertographer a ro logest a bottomet and representatives of other strance and also motion proture photographers.

Froposed Airpians hxplorations in the Antaratic Flans are on foot in England for another antarctic expedition which is expected t start in June 1930. It is t he led by I L Cope, who we as member of the last blacklation expedition. The party is true south in the form Nova the wessel used in words fast expedition and it is planned to make extra experimentors of the interior of Antarolles by sarpiani, including a flight to the south pole.

Gravity Observations in Canada A raport from the Domano Deservatory, Uthers state that 4 andhas now a line of gravity status or right at one the continent, sowering more longited that is to recred by another serve of estations on the Am rean continent. These in conjunction with the gravity observations taken in other parts of the world will furnish valuable data toward the determination of the fourir of the earth MF WB Bown, of the UB & Gast Purvu is now combusing the Canadian observations with those of the I not state, for use in a new publication on this subject

The British Dally Weather Report sessed by the Metsorclogical Office in Lendon has recently undergone a sotable corposation, reflecting the great increases in the work contride on by England's Clerk of the Weather in response to the world demands that areas during the war Stone Agril Let the sport has been sested in three cognition sendons, vir. a British for too, an International Restion and an Upper Air Supplement All three sections contain weather maps In the Upper Air Supplement there are negar of the British Isles showing the winds at various levels from the surface up to 16 000 feet, for afternoon, weather making and morang. This is primarily for the information of aeronant but will prove of great interest to all meteorologies.

More Information About Balsa Wood -An article on the remarkably light wood known as bales, now extensively used in making his rafts, certain parts of sirplanes, etc., and also valuable on account of its heat-American story and the second story and the second story installed in the Second story and th W Rowies of Cornell University who was mui to Central America last year by a New 1 irk company to study balsa in its native environment Professor Rowles has just published in the Journal of the Washington radamy of Sciences an article on the botameal characters of the wood. The balas tree belongs to the genus Ochroma Formerly only two species were recognized the one which was the source of the wood imperied to this country being known as Oct miligopus Pr fusion Rowles a investigations moreas: the number of known species to nine. He states that biles is usually a second growth tree, appearing promptly and abundantly where clearings have been made by natural or human agencies grows with astonishing speed fron attaining a height of 60 feet or more in five or my vears. It is doubtful whether any other tree grows so ripidly. In its natu il state the wood is very peruhable decaying with u parently the same rapidity as a cotton fabric 11 balls wood of commerce m made 1 crahle and waterprof by a special treatment invented by R A Mart 1 tropical America this tree bear many names bes less bales which is inspely a Spacesh word for "rai in allusion to the fact that rafts of this wood are used in alludon to the fast that rafts of this wood are used for transportation surpasses on the Nouth American rivers. In Micharquis the tree is called 'gatille, in Customaia, "indica" an the wort count, "mobio and "inna" on the seat count, in Cube, "lamille in Jamanes," evertwood!" and down tree," on as the Jamanesa negrous frive it, simply "dism" Heles proved its middly in this way, when it was not only used actionarily for lifewish and Info-boxing across the Neuth Comp. 18 to 
# Industrial Efficiency

Scrap from and Steel of Panama—According to a statement made by the general purchange officer of the Panama ( and there is on hand on the International thousand tune of strap ron and stiel available for the positron and the monthly accumulation to approximately 500 tens. It is realised that there is but a limit of small for sears prem and otted in the United St tes therefore, the Purchange Lynatics it of the Panamacanal at Washington does a top it in tach with export uncersis that would be not cested in securing supplies for adjuncted to I propie

Scaffolds—During the piet war there have been tripated a number of accinited when have coursed as a created of scaffolds by aking, illapsing or falling. While these are itself are not frequent they are as a rule of a string nature to metruction of acaffolds of extraction and the scaffold of extractions of the scaffold and the scaffold are string a sentent significant control of acaffolds are constructed on that they will safely stand the load which they are expected to bear its away important that no constructing acaffolds nothing but sound high-grade material be used, and that the work he arrafully and throughly done

British Rules for Employment -The exigences of war made it necessary in main trades and occupation to introduce employees who under the pre war rules, practice or custom obtaining in the trade could not have performed the class of work on what they were placed hear men are called dilutees In order to facilitate the return to pre-war practices in this respect the Minister of I abor has laid down the following general principles for the guidance of employers in dealing with question of priority of employment and discharge as b skilled men and dilutess (1) Where two workers are employed in the same department and on the same class of work, one a skilled man and the other a dilutes, and one must be discharged the dilutes should go (2) If s skilled man is unemployed (whether as result of discharge from a factory or as a result of demobile and presents himself for employment at a factory when dilutees are amployed in the trade in which the applicant m skilled, he is entitled to claim engagement and should not be refused employment at his trade on the groun that there are no yas ans see and that his engagement would involve the discharge of a diluter (3) Where in a single establishment there is more than one department in which workers engaged on the same class of work are employed, and it is necessary to discharge workers en-gaged on that class of work, no skilled man abould be discharged while any dilutees working on that class of work in the same or any other department are retained

I imitations of Women Workers -We have often he ard it said that women are not successful at work where micrometric measurements play an important part, or where great exactitude of some other kind is demanded We are of the opinion, however that this is a mistake, and that such failures as may have occurred in this direction have been due to improper selection of the workers there is great diversity among men with respect to esparaty for precision work, and differences stell more marked may perlesps coust among women, but British experience has shown that excellent results may be had from women even along these lines, if the proldent is fairly and intelligently faced. In Great Britain it has been found that even in connection with operations requiring a remarkable degree of mechanical precision specially-selected women after a comparatively short training course, have shown themselves able to pirform the work just as well as men who have had equal experience and matruction It cannot be dened, The Tracker Standard continues that women are inferior to men, on the whole where strength and muscular endurance are important clements. The average won is not as tall as the average man our has she so long a reach These two factors affect her lifting power adversely, and they also diminish her radius of activity that is the distance at which she can still do things effectively without moving boddy from her station Moreover, if a man and a woman have the same height, weight, and general physical development the man can almost invariably exert greater strength, and maintain a rular strain for a longer time, than the woman, and if greater reach, lifting power, strength or onduranie enters in the cycle as a determining factor the man will prove the larger producer

# A United States Port in France

American Accomplishment in France a Model for Needed Reconstruction Work

By C. H. (laudy

Special Correspondent of the Scientific American in France



In so only natural that looking it the big job America has done in France the American people should see only the but things and the I rais not at all or as a confused mass rather than as detined points. This was taken with at we have transported and manufactually distant two million men in France but of the Property of the American Confession of the Transportation, that manufactuation of that transportation, that manufactuation of the Transportation, the Transportation of the Tr

rather vagues
Yel some one had to think of the details in advance
I wo million me a requir an enormous amount of manremant. I have must not only be find and dothest, but
the multirudinous impediments of an army must 'exapplied Ours aminumition and explainers are
part of the problem. There must be applied materials
ruchat telegraph and the problem to the problem of the proble Yet some one had to think of the details in advance

and inefficient method of lighterage from ship to shore or it means don't docks of course, but by no means enough docks to take, care of her own wants and those of America too. France had to be for from without and she had to receive the troops from England and she had to receive the troops from England and she had to receive the troops from England and she had to receive the troop from England and she had to receive the troops from England and she had to receive the top from the cold to add America and and maintain her troops. Prance could not stretch one dock to berth two ships Morsover with all rappet, to French methods America has her own way of dong things and it is emphatically not the court method. See the United States, through its engine cap proceeded

doing things and it is emphatically not thorout immediate. But into the three three three three three three three to carriage it over desking fashine in Praces By no means at it over desking fashine in Praces By no means and it of 80 ship borths averaging 410 feet in length three not all Assertions but Many were sequented from the French But all felt the influence of American labor away devices and had some American sarpe handling devices untialled Otherwise, the tonnage of 40,000 daily, noneasary for our Army could never have been landed fast enough.

At one time or another America has used versatically

daily, necessary for our Army could never have been landed fast congst.

At one time or another America has used practically every port in France. We constructed new facilities or took over berths at Le Havve Rouse Obserbourg, Granule, 8t Maio, Rest, Lorente, 18t Nasare, Kantes Monton, Donges, Les Sables, d Olones, Le Philice, La Rochella, Rochelort, Faulino, Blaye, Toronte Basson, Burnell Bayronn, Cett. Marzellier and Research Research and Company of the Company of

at their best. It is literally a slice of American efficiency laid down in France, and, it may be said, to the wonder of every French engineer who has seen the work grow from nothing to perfection an an incredibly short time, and in spite of difficulties with might well have daunted one. Therefore have described the same france for

and in spite of difficultses which might well have datased even United States Army Empire :

The work at American Rescains which is on the east bank of the Garones rave about three miles from Bordestix, was begun in the tises immure of 1917. It should be understood that the sonth mpilated propose was not only a dock, with better in ten vessels but molecule everything that makes a do k into a port—a powder.



Fire fighting equipment on American decks

dook, recoving yards, departure yards, warehouses, water supply, sweenes, railroad tacks cargo handling devices, everything necessary to get the freight off the vessels, stere and soft at, and ship it away into France

vessels, sters and cort st, and shap it away into France
From the outset the work was been by the natural
difficulties inherent in trying to construct a huge segneering work 5,000 nailes from hims. Material was
difficult to get free America and must that did come
through was, consistents; in the case of heavy timber
in such poor conditions as to be unavailable for us
France had, or thought she had no timber available
but the first forestipy operations undivision in France

by American forestry troops growed the centerary, and, when the transportestion difficulties were reversely, and, when the transportestion difficulties were reversely, and, heavy piling and timbures begins to be swrighted in sufficient quantities.

The site of American Beantes was compiled by barready used by Indo-Yames sumplyed. In a pervise well-and the state of American Beantes was compiled by barready used by Indo-Yames sumplyed. In a pervise well-and the state of the property of the other, the Amenistic harring no regard whelver fee mantation! But six wester work removed the barready and the state of the test state of the test state of the test state of the November. It is neither the policy me the wish of the Strawters and barge constructed active work on the project staff started in November. It is neither the policy and not do all as a structure when the mantation is here was a discovered to the state of th

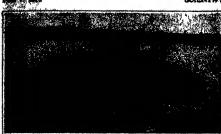
The departure yard, located half a mile northeest of teachs has 30 miles of tracks and 106 strikehes, four of



thing were unleaded at Bassans factor than the goods could be cleared



General view of American purish at La Photolina in the agent parties of the





Sand-sucker dredge at Bassaus

New berths in French port at Ba

which are of the double slip type. The receiving yard, a quarter of a mile southeast of the dook has mx and a half miles of track and 34 switches two of which are double slip At the completion of the project there were but two beavy gantries installed, the dock not being strong enough to support the immense wheel load, required should the cargo-handling devices all be of the origi

enough the carge-handling devrees all he of the originally planned character. But conditions had now changed and for the hetter, the material necessary to make the dock strong enough for these most efficient of cargo-handling devices was now avail sable. A board appointed to consider the matter west into it very exhaustively and finally decided upon the strongthening of the dock and in September of last very 3,00 additional piece and half a million feet of lumber were added to the dock so that the entire 10 bettle south of equipped with the entire 10 bettle south of the complete with the entire 10 bettle south of the control to the state of 46 of these big cargo-handling devices, or four to a slup Some of them are five and some 10 tons leapanetly but it was rare indeed that any of them could work to capacity, maximuch as most freight is bulky rather than heavy.

The completion of the installation of the heavy geatifies gave the Bassan project.

he completion of the imministration of the heavy gautries gave the Bassans project an unloading capacity of 12,500 tons per day or enough to care, alone, for an arm of 500,000 men Indeed, the unloading capacity of the transe exceeded the capacity

capacity of the craims exceeded the expective of the available forces to carry off the freight as it was lifted from the vessels, and, as one of the pictures shows, freight congestion on the doclifited has more than once been the measure of speed of unlocating

It is difficult to convey a picture even with the sid of

It is aimout to convey a picture were with use and it bes photographs, of the fewerish activity of this entirely efficient plant in action. In no other port in France is there the same capacity to unload and cortainly, without it, the army must have suffered for want of the average of 50 pounds per day per man which is necessary to keep a fighting lorce in France supplied with food, clothing

ammunition, arms, squipment and miscellaneous supplies. The reader will not consider the picture of freight congestion as typical of the operations at Bassans. The sunken railroad tracks the storage area and the switching arrangements are such that save upon exceptional days the dock was kept clear of freight even with the forty gantries working all at oses. Having been most carefully planned, there was little if any delay in getting the unloaded freight into sither trucks or cars and if the



Lighters at work at American Bassans

O 8 was able to function so that the army first of of-S O S was able to functions so that the army first of of-cases and now of occupation, could be fed and clothed and supplied, it was largely if not entirely because of the efficiency of this since of American means and methods laid down in a port which, famous the world over as a port, had nevertheless, up to that time, seen orthing to compars in speed with the American method of freight has diling

Too much attention must not be given American (Continued on page 613)

# Killing Weeds with Live Steam

A Sa means of killing weed seeds fungous growths and plan of stribung the ground with live steam before the seeds are sown. To have or sellings are very sensitive and especially susceptible to root tot. The fungus attacks the roots of the seedings and subsequently senously affects the vitality of the plant. For some years surface burning or building a tire on top of the

prospective beds was practiced in various sections. This was not entirely successful how ver and the new plan of killing fun gous growths weeds and insects by steam has been carried out

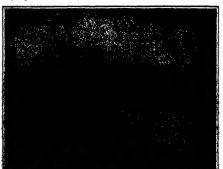
599

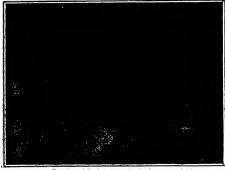
Experts of the United States Department of Agriculture have estimated that the pays for the cost of starilization. Not only that but the new plan has also been suggested for use with other scedling bods This plan in short kills the words before they cin come up

Steam sterilization of the seed bads simply means that a pertuble boiler is set up near where the work is to be carried on while an inverted pan of metal or we l is placed over the beds after they have been prepared all ready for seeding Steam under pressure is turned on for half au hour which accomphishes the work. In some places farmers are buying boilers for their own use requiring them or owning

em in common with other farmers ordinary threshing machine boiler or in fact any boiler

ordinary threshing machine boiltr of in fact any boiler of 20 horse-power or more—depending somewhat on the saze of the steaming pan—is suitable. It is essential that there be enough pressure to force atcam into the soil. A pan having an area of about 72 square feet is regarded as about the right less is Wooden pans are chespor than those of galvansed iron. The pan simply consists of a wooled frame with boards nailed across the bottom and of course very stringly reinforced so as to (Continued on page 612)





and educate with live steam, such an example of its work. The plot at left of partition inhowing heavy growth of woods was not trisited; that at right was

# Much Wheat-Little Corn?

# Close Relations of the Two, and How the Size of the Corn Crop Affects the Price of Meat

By the Washington Correspondent of the SCIENTIFIC AMERICAN

WHIN the United States Government undertook V to feed the world with wheat its most effective step was the provision of a guaranteed price for the wheat \$2.26 Chicago

When the armistic came along and there was the less ecessity for wheat, the price had still to stan I because necessity (or wheat, the price had still to stan I because it was a covariant between government and individual And it's human to take advantage of apportunities as darmers all over the land planted what and vit more wheat and then still more wheat in the comforting saurance of a high price regardless of the sun of the trop or economic conditions of demand. There is only so much land. If all of it were planted in

wheat obviously there would be none left for corn o cotton or tobacco or any other of the hig crops. Of course the character of the land and the chimate have an automatic check on over-planting. Wheat won t grow on all farm land, nor is the yield big enough in all chimates to make it worth while even at \$2.26 per bushel. But there is much corn land on which wheat might be grown, at least so think many who are timid about the p most, and it has been a matter of some moment and a good deal of wonder to many who study food economics whether or not the record wheat planting of this last winter and this spring may not so reduce the corn acre age and yield, that meat (which depends largely on corn for its growth) will sky so high in price that no one will be able to buy it save motion picture actresses and

millionairee

Nobody really knows anything about it, yet, because
no statistics have been gathered about the corr planting
this year. But there are certain straw which are indieations and they are, luckily for our peace of mind,

very comforting straws
It should first be explained to the non-agricultrual when that winter wheat is normally about two-thirds of the total wheat erop, and that there are two ests of statistics about it while only one is usually made for spring wheat Winter wheat may be, often is, winterkilled. So the acreage planted is one thing, and the acreage harvested another. Corn and spring wheat are usually harvested in about the same amount in which they are planted

they are planted Department of Agriculture statistics for 1919 show that of the 49,261 000 acros planted in winter wheat, 48 933 000 will probably be harvosted This is the greatest areage of wheat over harvested in this country. greatest at reage of wheat ever harvested in this country the harverted figures for 1918 are 18 704 000, for 1917, 27 457 000 and for 1916, 34 709 000 the great difference between 1916 and 1917 being caused by a severe winter-killing In 1915 we harvested 11 408 000 acres and in killing In 1915 we h

Now look at the eora figures In 1918, 107 404,000 arres, in 1917, 116,730,000 arres the greatest corn acreage over reaped in this country. It was great because there was so much winter-killing of wheat and winter-killing wheat fields were pi we'd under and spring-planted in corn. But the figure for years before that are almost unvarying In millions they run from 1910 to 1916 in the amounts of 104 105 107, 105, 103 and 106 milions acres regardless of the much greater fluctuations in the wheat areas harvested. Now compare with the wheat areas planted (remember the wheat figures here

wness areas pianted (remember the wheat figures here given are winter wheat figures old total figures). Beginning in 1914 and running to 1919 the figures, in millions, are 37, 42, 59, 40, 42. 40. In 1914 we planted 37 millions acres wheat and millions. Corn; came from 103 millions acres in 1918 we planted 42 millions wheat, reapped 36 millions wheat, and 107 millions acres in 1918 we planted 42 millions wheat, reapped 36 millions wheat, and 107 millions acres in 1918 wheat and 1918 wheat and 1918 wheat are shown as the same of the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres wheat and 1918 wheat are shown as the same acres w wheat, and 107 millions corn is there anything in these statistics which would prove that an unusually wheat crop meant an unusually small corn crop?

But there are other straws besides the rather unsatisfactory ones of judging the future by the figures of the past. There are certain factors which seem apt to increase the planting of corn this year. One of these is the campaign in the south squiist planting too much cotton. There was a large carry over of cotton last year. Hence the educational campaign designed to divert some acreage from cotton to other staples—and none grow better in the south that sorn, its other great erop Corn is rather late this year because of the beakward syring and so reports of core probabilities are slow in coming in But in at least three states, Michigan, South Dakots, and Arkauses it is known that the corn

South Dakota, and Afkansas it is known that the corn arrange has been increased over last year. Of the total corn error, 75 per cent is used as fodder and probably 60 per cent or more is used for food for meat animals (as distinct from horses, mules and over the corn statistics are so interesting to those to whom the price of meat an object. If too little corn, they argue, there will be

higher prices of meat

But here comes in a funny little kind of food eco But here comes in a funny little kind of food economies of The prospects of a bumper ergo of fodder usually increases the price of meat animals at the time of the prospect of a pone ergo decreases the price of food animals at the time of the prospect. If it was to be known that corn were to be vary soarce the price of longs, for instance, would decline. The season is amplie amough 14 m and has 100 hoggs and thinks he can t get corn to fatten them, he offers them for male so the other fellow and to the voryring. So do all the other fellow and to the voryring. So do all the other help with a season that the contract of the corn was a season of the contract of the hog owners They giut the market with haif-ded hogs. When the supply a greater than the demand, prices fall Par course, if the owner knows he as to have plently of corn, which means cheap occup, he will beld has hogs and fatten them later, knowing he can get more for cornstatened hogs than for the sorm and the lean hogs, uncombined. So that prices rise because hog raisers

are holding hogs
The reaction is equal The high price to cheaper price when the hogs are fattened and sold, and a cheape from when the hogs are fattened and sold, and a cheap hog market today due to prospects of lack of corn, means a high-priced hog next winter There is no apparent falling off in the price of bogs now.

# American "Mystery" Ships

# Cleverly Protected Decoys Prepared for the Destruction of U-Boats on This Side of the Atlantic By Eric A. Dime

DURING the last year of the war stories about the British "mystery" ships percolated through the news channels and gave the reading public a slight idea of the means employed by largiand in combaining the German submarine warfar haturally very little was corman submarine warrare Acturary very fittle was reported about the construction of these ships. All we knew about them, was that they were merely decays dengand to lure the prowling subs into a trap. The vessels looked like ordinary slow-going freighters but when the U-boats came within a reasonable range of the mystery ships hatches would suddenly open and behind them guns would bark at the enemy

n the United States declared war on Germany. naval authorities realised that American shipping along America a shores might be menaced by the Hun's ses prowlers. And surely enough that is just what happened Across the Atlantic came the wasps of the sea and they dealt their death stings to several of our merchant vessels

Of course fighting craft from our navy were constantly on guard along the coast and waiships and U-beat chasers were supplemented by two other vessels that looked for all the world like ordinary cargo steamers carrying provisions from our shores to the ports of Europe The two innocent-looking vessels were the patrolling our waters from the rock-ribbed coast of Maine to the Florida Keys

Our Navy Department knew that the British decoy ships had experienced some success in combating the U-boat menace, and as soon as we entered the war it was deemed advisable to employ the same methods in local waters. Now since the German navy has been local waters. Now since the German navy has been nicely tucked away at Scapa Flow where it can do no harm and since German militarism has been knocked off its pedestal of power it is possible to lift the veil of secrecy, which kept the public in general in the dark on named matters while we were fighting the Huns

The American inputery ship was designed as a decoy ship for combating the submarine warfare, by Warren S.

Fisher, recently attached to the Naval Intelligence Bureau and his plans were submitted to the Navy Board three weeks after we declared war on Germany Mr Tisher's decoy represented new ideas superior to the British decoys in the fact that instantaneous action of gunnery was assured and greater protection was given the ship in course and action

The guns on the British ships were concealed by false structures built about them and these structures neces sitated loss of time in folding preparatory to action and that incurred in securing the image and proper sight The American designed system obviated this loss of time by the novel method of having the guns countersunk in pits that would allow them to be concealed just above deck behind false panels. In front of the muzzles of the guns were rubber disphragms flush with the sides of the ip and painted the same coir is the outside of the ship

On top of the guns were sights extending beyond the parrels and slung in the rubber diaphragins. This rusde it possible for the gunner to sumg and range his gun im-mediately upon observing a submarine. Thus prepared the decay vessel could move along leasurely until the 1-boat came within a satisfactory range of fire, and the guiner on the decay could get the sum at the enemy before the latter realized what was to happen. The strongest glasses on the U-boat would reveal nothing but the flat add of the decay, the sight protriding through the rubber. ig too small to be seen or if seen at all it would be mistaken for a rivet head or other mnecent-looking speck by the U-boat e-mmander

This arrangement would give to the decoy the first shot in action. It would be a surprise abot to the enemy and a strught but would possibly finish the sea pursite. The discharge of the gun would cut a hole in the dia-phragm which would be replaced by a new one, when the simp should be ready for a new action. The decay skip in action was protected by a series of false steel plates flush with the rall and bucyred when its the water and resolving from ten to twave feel below the surface Air chambers extending along the tops It would be a surprise shot to the enemy

of the plates kept them affact. These plates were attached to the ship's side by rigid steel ribs, which, when released, dropped away from the side. They extended a dustance of from 20 to 25 feet from the shap's

standed a distance of from 20 to 25 set from the shipt, and—a sufficient dataset of exploid a topped without damaging the reseal. The wall of water between the plates and the ships and would serve as a cultion in the event that a toppedo exploided against a plate II one plate were struck it would not affect the others as they were constructed independently of each other, being connected only by chance to form alignment. It was essential to have some sort of protection for decoy against possible torpedo stated from the U-host at the moment the deck gains opened from the U-host at the moment the deck gains opened from the U-host at the moment the deck gains opened from the U-host at the moment the deck gains opened from the U-host at the moment the dots of the withermelbe, but it would issued simultaneously a torpedo against its adversary. Host of the withermelbe, but it would issued the commanders of our decoys had to take this extra precaution. The sides was to drop the plates into the water as soon as the deck gains opened up on the seemy. The ship corride extra plates, so that if one or more were destroyed by a torpedo charge, tway could easily be

The ship correct extra pieces, or what if eace or more were replaced by others. It was not the ideas or more were replaced by others. It was not the intensition to long this piece was a state while the ship was running because they would have offered too much of a drag. Another nevention, designed to present the decoy against anthorough mines, was also offered the government by Mr Faber It consisted of a torped-chapted device operated from the breige or buy birst independent of the appreciate of a torped-chapted contract necessary for the appreciate, and the electric natural necessary for the appreciate, and the school contract necessary for the school of the scho

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# Correspondence

# The editors are not responsible for statements the correspondence column Assertment con

niestions carnet be considered but the name

# Clouds Formed by Airple

Cassats Formed by Airphanes
To the Reiter of the Scrawraro Assurant
In a recent inter from my broken, Capt Ward S
Wells, M C, 60th Infantry 5th Divison A E F, has
mentione the observance of rather strangs and wonderful
photocents which I thus worth passing on to you trackle me as being quite tunnish and portage worthy of
record, so I am sending the following quotation from
his latter

incide me in being quite unusual and perhaps worthy of second, so I am sending the following quotation from his letter

"The first part of October last we spint several days in the Boss de Hess watting to take over a part of the front line in the Arpoine." The shell holes from the front line in the Arpoine. The shell holes from the first part of the front line in the Arpoine. The shell holes from the first part of the firs

glass over the cloud.

"You may skeptically smile when you read this letter
but I sesure you that we were all in our right musts at the
time and I have not had enough New Years egg-nog
today to develop a creative imagnation
Exhaurt D Wall.

Mashua Lows

(The phenomenon of realite sound wases reported in the second part of the above letter to described in a said spitched in the Second part of the above letter to described in a said published in the Secondary of 
Squ-Classes for Lifebeat Service
To the Reiter of the Scrawytro Ammucani
While not impulsive with the Atlanto cose, I have
lived most of ray leby on the brink of the North Pacific
and would the to rive a few facts and make a suggestion
or ten.

"We have here a wild rough shore, with winds from the mentioness. Since these is, the winder time reach the winder of 60 winds as here. In the summer mouths they have Junes as here. In the summer mouths they have Junes the activists and constitutes as high large with the constitution as high private of the constitution as high the same of publication of the constitution as the constitution of the consti

entrances of our harbons and get to sea at all. And in less stormy weather when they do get out are too amail to tow in the vessel in distress and also too small to take off but a very limited number of the passengers

or srew
In case it becomes necresary to go some distance
from their station the alow specif of these locats makes
then very tardy in arrivings in their devinations.
On signing the Peace it raly our coverament will
find itself with a great must 10-foot sub-hasses on
its hands. Those books have been described as well
built fast and seaworthy. With could they not be
worked over somewhat, und it the supervision of competents areal architects and make excellent coast.

competent asval architect and make excilent coast guard boats?

With decks one and aft rused and heavily crowned steel water tight buildheeds steel dock house and pilot bouse large ventilating sta is to meure good variableton when everything is battent clown and a par of heavy towing bits these boats should be able to go maywhere regardless of weather conditions and do real work in saving lives an lase boats into this service the Government might necessity the saving lives and have boats into the service the Covernment might necessity the saving the savin

CIARENCE & PENNOCE

# An Abourd Figure

An Absurd Figure

To the Editor of the Scunwick Auritican
In your sume Desceiber 7th 1918 I note an article
entitled. The Saving Grace of War dealing par
inclusity with Dyperdoute of menufacturing industries.
On the article, as a whole, I want to congratulate you
and hops it will be followed by other articles of smiletenor. In the distilling humness what might be termed
they-produced "——that is, the fit is recovered is now
becoming the pranagal product and I have no doubt
assaw will apply to other lines of manufactures.
In the article above alluded to on page 464 you say.
One company is delitting, for in antiversation that the company is other lines of manufactures.
In the article above alluded to on page 464 you say.
One company is delitting, for in a this waster the sinth that obtained from the best grans and which bears no
resumblance to the III-melling wood against The
product releases cereals for for it and provides a valuable
that the state of paces and war. I has contain place
can also be condensed to the consistency of molasses.
The light brown compound which results in much in
request by the foundries, which just now an overwhelmed
by Government contracted. They are paying from 18
to 15 cents a gallon for it to mix with the sand of their
models. The adhastive qualities nature the firmness of
the impression and lower the previate of detective
cataga. As a bunder is core mix 0000 gallons (precentally daily) must be a market on the part of your
contributor, as there was not that much thyl sloobel
produced even during the war when it was needed to
and of the bunders. It is well to bear in much that
every time one of the big guns is fired it requires the
as of one barried of alcoholo.

Lousville Ky

# A "Sharp" Horse Shoe Wanted

To the Editor of Tun Schurring American
The most urgent want of horse men at the present time as a horse shoe which will easile a horse to be driven at rideen sately on harved automobile roads

radden askely on terred automobil roads. In this country a stempstified near started offsring \$600 for the best horseshes for the purpose. Here were \$50 show mehmtack, bet show indifficied the conductoms. The instat unsalidationy was are having a rubber har at the hoat, the near to one having now embedded not her since the third just the plain assects fits about This competitions shows that northrast has yet been

invented in my opinion if a since should be made which, she ap-between made work, her a surject this a charp file the problems would be solved. In these same file the problems, parked to start a self-shappens as it is used notabless, parkeds staded up of two substances in charp-naged expusin, one soft and the other hard. This subject as the fundamen importance, not only to home owners ind fresidents, but wen for the preservation

of the horse species as nobody will keep horses if they cannot stanil up and work on tarred reads Already the pleasure horses in this team have been lmost reduced to a thing

Then me the Lend is Season and whereas till some the me true to the transmission and enterial ill some ten years and the parks were as park I with home pleasure carrange, that the horse it do be constantly stopped in the inastic traffic is wysterday in Hyde Park at the rasiful mail in me bessies myself who was driving an Auc ri accept twag or with a pacer, there were only three stirt is leave vehicles in the Park this was because the roads are so tarred that it is

danger us to drive horses with the present horse shoe.
If you would kindly put is it thus I the in your paper perhaps we horse owners near hear of some remedy for our triplic and lic able to prevent our horses from falling and breaking their legs Walter Winama

I and an I neland

# Rolling 45-Ton Boilers for a Dutance of 21 Miles

I is one thing to rescue the boiler plant of a stranded ship from the clutches of the sea and quite a different matter to move the salvaged bookers to a point where

matrix to movi the alwaged bosters to a point where they may be put into a sivile again.
Late in the fall of 1017 the stransipp Bear went argument on the northern coast of californa. It was impossible to hast the vise 1 if the sands and the only alternative sale to salve as me he is rearge and fittings as passible. Banks to the a tivities of th. U houts this salp a plant represent 1 s high market value. There were six bid in in the vessel each worth about \$5000 and after the smaller stuff lind been taken out of the shap the bosters were removed. The plant was to take them to lurnak of it while they were to be shapped to bhappha and 1: installed in another hull. But here were, the bookies, or a disolate coast with no means of transportation at hand and Lurcks the nearest port lay some trenty few miles to the night like the night like the same as small.

were the bulk're or a disolate coast with no means of transportation as hand and Lurak the nearost port lay some twenty live mile to the nirth. It was no and it fast as the more than 1 he will be seen and it fast the more than 1 he will be seen and it fast the more than 1 he will be seen and it fast the first single stems was to ship them by an an area to be loaded on a nable neagreeton. It will be seen a fast to be loaded on a nable neagreeton. It will be seen a fast to be loaded on a nable neagreeton. It will be seen a fast to be loaded on a nable neagreeton. It will be seen a fast to be loaded on a nable neagreeton. It will be seen a fast to be loaded on a nable neagreeton. It will be seen a fast to be loaded on a nable neagreeton. It was not the seen and the continue to time but without success and almost a year clapsed before that plas was abandoned. The only other alternative was to roll the bollers along the coast to Humbold! Bay and that was no sumple task. A roadway would be required for the bollers to roll upon in places the rooks came down to the water a edge and a passageway would have to be blasted through them. There were two rows in the excessed. The bollers themselves were of such large diameter in proportion to that length that they would be very unsteedy. Neverthales a Lureke company contracted to perform this strange moving in).

a Lurcha company contrasted to perform this strangs moving juli.

Imbers were laid along the beach to keep the bollers from anking rato the said and a donkey segme was set about a quarter of a mile from the bollers. A 4-ment laid stop, the close was the said to the frame of the donkey rangen and laid stop, the close way it to the winding drum of the saigner. As the captain would up the limit be boller was relied along the readway but it showed a tendency to swing off to one ader or the other. However this difficulty was overcome by pulling the ground into to the safe boller headed off to the right the ground into the said bauled to the right so that the bught of the line would be headed off to the right the ground into the said bauled to the right so that the bught of the line would be headed to the right so that the bught of the line would be headed to the right to the the bught of the line would be headed to the right to the the bught of the line would be a time into almericant with the readway. The team was the tribed to a brick use the line and as it husber rolled up to the block it was loosened and slapped about The meavers became expert at correcting the rolling of the bushers and were able to the without stopping the engages. In the way the locker were railed one at a time in stages of a quarter [a mile for a dutance of 1 miles.

There were frequent delays while the roadway was

Then were frequent delays while the rotaway was being prepared Often work was instrupted by ide and storm. In some places the movern had to wast for the total control of the total control of the point of the being stored a rocky point that rached down to the water him.

The Bear three's hinch was the first six an encountered that not be the rolling process. A forth was control and the beat river the Pel no convenient ford was to be had been the beat process. A the second of the period of szere use nouzer were insued on a narg, and towed one at a time to a spot two miles away where the could conveniently be landed and rolled again. At Humboldt Bay the bulers were all loaded upon a single I arg; and toward to Eureka bringing this unique moving operation to a successful conclusion.

# When Freight Cars Bump

Recent Tests of Draft Gears, and the Resulting Developments

By Prof J Hammond Smith, Department of Civil Engineering, University of Pittsburgh

IN the early days of railroads car couplings and drait gears did not receive much consideration. In those days the engines and cars were light and me ved at comparatively slow speeds. But in the development of railroading the tendency toward heavier engines cars car loadings and higher speeds has been decidedly pro-nounced. And as a result lack of adequate shock absorbing devices between cars is the damaged cars as well as damage t the lading of merchandise which shifts with each impact. This annoying and destruc-tive effect is felt in all closes of traffic including the passenger service. Therefore including the passenger service. Therefore the scientific study of principles, and the the standific study of principles, and the application of improvements in art coup large and shock absorbing devices are of principles and shock absorbing devices are of principles and an articles and a standing from the railway engineering societies and especially from some of the foremost railway-mechanical engineers of the country

Louis I Indaley Professor of Railway-Mechanical Engineering at the University of Pittsburgh, has devoted special attention to couplings and draft gears for all types of cars. In order that better data for the design ing of draft gears might be available tests to determine the impact between cars in switching service have been successfully completed Fig 1 is a plan view diagram showing the application of the apparatus used in deter showing the application of the apparatus used in derivating the relative velocities and impact forces between cars when switched together at speeds up to eight miles or more per hour. A stretch of track with a uniform downward grade from A toward D so that the cars would just stand on the track without shifting dewnward when the brakes were off was selected. The string of D etc were coupled together but b cars H ( D etc were outpled together but before each test the slack in the couplings and draft gears was taken up so that the cars stood on the track with practically no stress on the couplings between them impact as in awitching, was produced by allowing car A to run down the track against our B at velocities measured by means of a stop-watch. A diagram of the impact recording apparatus (a photograph of which is shown at recording apparatus (a pnocograph or which is shown a bob in Fig 3 is shown adjacent to car R which was to be tested for impact received from meving car A. This instrument was mounted on a rigid stand at suitable height and distance from the track. R is a chronograph eylinder rotated at constant known speed by a storage battery motor having its axis parallel to the track and on which paper for receiving the autographic record was mounted. A guide bar F, parallel to the axis of the cylinder carries the pencil block P which was connected to the car at a point on the outside sill by means of a link G which was also parallel to the axis of the cylinder

This apparatus is therefore capable showing the relation between time and the velocity of car B, at any instant and since the variation in velocities during the hundredths of seconds may be determined accelerations can be determined with accuracy J F H in Fig 1 represents a record from cylinder K developed H J being the circumferential line traced by pencil P before impact. At impact car B is thrown to the left and as its velocity increases the pencil is drawn away from the sero line H J thus forming the raised portion of the curve as shown at E bince the maximum slope of the curve between J and E is a measure of the maximum velocity of car B and since the weight of car B with its load is known its kinetic energy may be determined by the

$$K = \frac{1}{2} \frac{W}{a} e^{a}$$

In which A-kinetic energy of car in foot-pounds, W-total weight of car with leading in pounds v- maximum velocity of car in feet per second as determined from the autographic record and g-gravity acceleration taken as 32 2 Thus, when car B, with load weighs 248,000 pounds, and the maximum velocity

is 2.4 feet per second

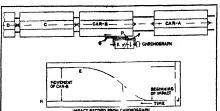


Fig 1 The apparatus for measuring switching impacts between cars, and a sample record

 $K = \frac{1}{2} \frac{248,000}{322} (24)^4 = 2$  100 foot pounds The kinetic energy of car A may be determined by means of the same formula For exar it using data from the same tost as that consider i above W = 248 000

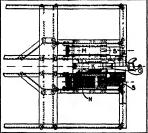


Fig 2 The newly designed draft genr with primary and secondary elements for withstanding heavy impact

pounds and v=5.55 feet per second from which K for car A is found to be 116,500 foot-p unds If no kinetic energy had been dissipated during impact one-half of car A a kinetic energy would be transmitted to car B (ance the two cars were of equal weight) but from the

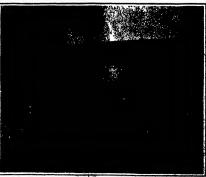


Fig 3. Apparatus used in testing draft gears and our sills. D-Impact recorder

above computations, we find a her 119,000 — 23,100 = 94,600 Soot-men This energy must have disappeared in form of friction. Sense of it was about in the draft genra, some by the shill loads, and the remainder was used y. straining and destroying both pars A

Impact force on our B, may be determined by means of the formula

F = We.

In which F seriors in pounds on ear B, W = weight of ear B with load, in pounds, a = acceleration of ear B, in feet per second, and y - gravity acceleration, taken as 22 2 Now in order to find the maximum force F, it is necessary to substitute the maxim

rains of sceniersidos. This measure seample record obtained from the sutographic record F, Fig. 1, by finding the largest difference in velocities of car. B at successive intervals of a fundardith of a second. For example, if the total weight of car and load is 248,000 pounds, and the maximum value of a is found to be 91.4, substitution in the above formula gives In those tests, the maximum force of impact was always found to take place before our B had moved always found to take place before our B had moved always found to take place before our B had moved by the control of the contr

next to car C

There are many types of draft pears, but all may be placed in either one or the other of the following classes; (1) Draft gears in whrh springs are used to absorb and distribute and thus alleviate the sudden abook. (2) Draft gears having friction discusse supplemented by springs, for absorbing a part of the impact energy. These types have single grimary shock up to the initial content of the property which are capable of absorbing a book up to the initial content of the respective when usually not over 200,000 pounds with a movement of two and a half inches. But when the shocks are heavy, as n raugh synthetic services.

pounds with a movement of two and a half inchess. But when the shocks are heavy, as an rapid switching service, where the pressures with ordinary car construction, with no absorbing medium may resch approximately 1000 000 pounds diraft gears having sangle shorbing unter have been found inadequate Grees ions in damaged cars and damaged shipping is the result. A new design of draft grar, by Professor Endelsey, contains features intended to overcome the defecte of the older types. In addition to the numary shock absorbing

older types In addition to the primary shock absorblas older types. In addition to the primary shock absorbing selected as used in the older types, be employ a secondary element to take the heavy shocks after the primary clement has reached the limit of its movement he above in Fig. 2, the primary draft par K, is contrally counted in the floating pare carrier S, in which are mounted the twin secondary draft passe M and N, the salls of the car registly connected to the salls of the car The springs and friction members of the secondary para are under initial stram, so that the abook first produces movement in the primary near

initial stram, so that the shock produces movements in the primary until it is nearly closed, when movement begins in the secondary mars. primary gear will close at approximating 200,000 pounds. If the horistst shocks, whether they tensile or compressive, may be damped without injury to the our, and with minimized injury to the contents of our contents o

and in testing draft geess and our The draft gear to be tested in one within the heavy side C, carrend in first end of the \$0.000, bound dar H, n is free to red on a straight level The impact is produced by a 15,000-is conducted. resonance is proceed a surface a surface as the same as represented to P is the same as represented in Fig. 1. The axis of the optimier being permitted at the car track, and the franking permitted to the car by means of a dail. If making tests, the same the latter toward the hearings, which is being the car which it is the same of a dail.

# Stefansson in the Arctic

# A Summery of What Was Done in the Five Years of the Canadian Expedition

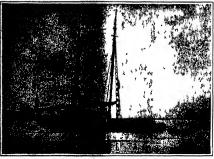
By John G. Holme

If there of approximately 256,000 square miles, or an interest of approximately 256,000 square miles, or a protect of share, was explored by Villajauar Selfanson, head of the Canadian Arctic Expedition, who has returned to civilanation after agending a little more than three years south of the Arctic Carole. The purpose of the majorour arcs, gather edentifie data on missine and exceptibility as meta-sensition of the analysis of the majorour arcs, gather edentifie data on missine and exceptibility as meta-sensition of the exceptibility and the exceptibility of the exception. In scientific excepts throughout the world, the keenest interest, of course, was sentered on the old question of whether the Pofar Bisin yeardened over the area of approximately

course, was centered on the old question of whether the Pfear Bein; extended over this area of approximately 1,000,000 square miles, or whether a land complex existed west of the known limits of the Canadian Arctio archipelago This question remains unaversed, al-though Biefanson did discover three stands of counderable suce But all of them are within or adjacent to the archi-pelago area Stefansson, accompanied by white companions, Andreasen and Storkerson, made a remarkable ice trip across the Beaufort Sea in the spring of 1914, going almost due north from Martin Point, and following a line between morid-ians 141 and 142 west to about 74 north latitude, thence in an easterly direction to Norway Island off the northwestern coast of Banks Island, a total distance of coast of Banks Island, a total distance of about 700 miles In the following spring, Biefansson with three companions, Andrease, Riorkersen and Thompsen, made another ise journey over the Arctic Sea, this time starting from Cape Alfred, the northwester point of Banks Island The explorer went northwest by north, more retrievestern point of Banks laiand. The explorer went northwest by north, more than three hundred miles then made a loop in a southeasterly direction to the southwestern point of Prince Patrick Island. On both these extensive see tripe and on

On both these extensive too kips and on subsequent too extravious covering lesser distances, such as his trip in 1916 from First New Hand to Cape Inschaen Eliof Elingues Laland, and thence to Second New Island, Stefanson took frequent coursings, observed the ocean currents, too drifts and prevailing wints. The result of this doke, los drifts and prevailing wints. The result of this doke, los drifts and prevailing wints. The result of this doke, and workward in the unsprinted region, but these indications chances, of ocurse, be regarded as proof. On the 1914 trip from Martan Point, is line of soundings was run from the Alaskan count northward between nervidians 141 and 142 West to about 73 North and theseo east to Norway Island. The continental slope uniform grade, while west of Banks Island, there were three well marked terraces between the depths of 200 and 1,200 meters. The continental slope motions grade, while west of Banks Island, there were three well marked terraces between the depths of 200 and 1,200 meters. The

60 to 50 miles of shore Once the continental shelf passed, Stefansson id no bettern at 1,286 see On the 1915 from Cape Alfred to an Patalek Island, Stefound McChure s reien Bazike and reiek felands, unStefansson s observations 200 miles north of Alaska showed a marked tendshey of the use to move seatward He found a strong current to the south or southwest west of Banks and Frince Patrick Islands quite as strong as the westward current along the Alaskan coast Stefassent from the evidence of any ourrent west and north of the new ulands. The prevailing currents in Melville Sound appeared to be toward the east. The prevailing winds north of Landson land was found to be north or Several places in the mark strongest being south by east magnetic disturbances, the most pronounced being in southern Banks Island. The ship's compass, carried by the expedition, became control unreliable a mile off



The "North Star," Stafagasen's most valuable ship, in the ice

shore, and Stefanston believes this may constitute a great danger to whelers. The newly discovered islands as well as the Ringnes island displayed indications of rising. Stefanson reports observing raused baselones methods not his land while sevated drift wood on Banks Island appeared to prove that this island had recently begins to risis. Methods the stefand had recently begins to risis. Methods and the stefand had recently begins to risis.

In addition to discovering three fairly large islands and many smaller ones, Stefansson proved the non-existence of the so-called King Christian Island which he found to consist of some small islands. With the aid of his companions, he mapped the northwest ra coast of Prince Patrick Island which McClintock had been unable to

Chistonia and Cox taking observations



An anofficial attaché of the expedition

finish in 1852, completed the north coastline of Victoria nman in 1892, completed the north constinue of victorial laiand and mapped the constinues of Finerald Isle and Ittswilliam Owen Island off Prince Patrick Island Both the shires of Hassel Sound between Filer Ringnes and Amund Ringnes Islands were retified and the average width of the sound proved to be over 15 miles instead of five miles as had been represented. Large

parts of the coastime of Banks Island were remapped First New Island was sighted by Storkersen on June 18th, 1915 This is the largest of the islands discovered The coast where the explorers landed was low but incuntains were seen in the distance toward the east The party penetrated 20 miles inland and from a linguit of 2 000 feet observed still higher hills at a distance of 50 miles north and east Stefansson fol-lowed the south coastline about 100 miles

then started toward his winter quarters at I wing spring 1916 Stefansson skirted the nuthern coast of First New Island chart m, the coastline and with four white men set off across the ice toward Lilef Ringnes island touching its northwestern tip and c ntinuing in a northeasterly direction. In June Second New Island was found. The June Scund New Island was found. The caphores returned by the way of Hassel Sund establishing, the non existence of king Christian Island supposed to lie south of Ellef Ringins Island and found litri New Island cast of First New Island August 1911. The mythical King Christian Island proved to consist of sex lat small lists such as may be found sex lat small lists such as may be found. anywhere in the archipelago region mer explorers had taken these uses to constitute one large island

The location of the three large islands is about as follows limit New Island has northeast of trince Patrick Island Its northern tip Cape Milmon lies in 78° 30 N and 108° W suitheastern tip Cape N and 108° W sutheastern tip Cape Mackay 77° 50 N and 110° W southern Ice Mackay 77° 50 N and 110° W souther tip ( spo Bouchat 77° 15 N and 118° W southwestern tip ( apc Murray 77° 55 N , and 114° 30 W

Second New Island hes North of Flief Ringnes Island,

Second Now Island lice North of Filef Rungues Island, and West of Axel Ruberty Island. Its evident points be as follows southwestern corner 70° 50 N. and 102° W. northern corner 80° 12 N. and 100° W. southeastern tip 70° 40. N. and 80° W. Third Now Island as the smallest of the three Its southern tip lies approximately in 77° 9 N. and 107° W. and 100° W. Stefansson also found a small reland off the northeastern tip of Yestors Island in the vulmer of 1017° total relations of 1017° W. Stefansson also found a small reland off the northeastern tip of Yestors Island in the vulmer of 1017°.

All the new islands were covered with vegetation and supported Arctic life except Second New Island which is barren for geologi al reasons Here Stefansson found

only Hutchins goese The other islands had reindeer m considerable numbers On Banks Island not vasited by white men since McClure was there in 1853 there were no muskoxen although Mc-Clure reported having numlers Stefansson be killed off all these animals of late years

the Canadian dition was one of the most elaborately equipped exploration ventures ever launched the Canadian (lovernment sparing no expense in making it complete for Arctic investiga tion Stefansson left Teller, Alaska June 27th 1913 at the head of a party of 13 scientists sail ing on the whaler Kar luk, commanded by (ap Robert Bartlett



# America Flies the Atlantic

# The Design and Development of the NC-4 (Navy-Curtiss Flying Boat)

THE genesis of the pian of the Navy Department to provide able sea-keeping ariplianes for deep sea work is to be found so far as the Navy Department records are concerned in a memorandum by Rear-Admiral D W Taylor Chief Constructor of the Navy, bearing date of August 25th 1917, which reads

as follows The United States Motor (Liberty) gives good promise of being a

and of the case and the arrival grows good promise of being a success and if we can push shead on the airplant end it seems to me the submarist menase could be abated even if not destroyed from the air.

The ideal solution would be big flying to do to the equivalent that would be able to keep the see (not air) in any weather and also able to fly across the

be sole to keep the sea (not air) in any weather and also also to by second the Atlantic to avoid difficulties of delivery. Flease think it over very carefully particularly as to the method of procedure to develop something as close to the ideal as possible.

A few days later than it is Commander to C Westervelt Naval Constructor. who had just returned it on abraud where he had no eaved werry opportunity to examine what was being done in the design and construction of artifactes and seaplanes of large sizes and J C Humsaker assistant for aeronauti all purposes to the Burna ut G construction Repair were called in by Rear Admirth Tayler to discuss this subject. On Styte inher 10th following Mr Gkinn II Curtise and two oll his technical assistants were called into conference at Washington and shortly after that Mr Curtise returned to Washington with a cased by the Chief Constructor. As the result of a conference of the gonit men mentioned above it was decided to go shead with the design of a three segme flying bast of about 1000 horse power the boat to be as large and its radius of action as great as could be priduced with this power. After a number of features which it was desired to embody in so large about had been worked out under Assistant Naval Constructor Humsaker is contract was made with the Lurius profiler the design for the made with the Lurius profiler the design for the made with the future profiler the design for the property of Naval Countrator Washington and was carried to completion under the supervision of Naval Countration Foundation for the supervision of Naval Countration Westerfut to whom had been given charge of the work, with whom were associated Assistant Naval Constructor Humsaker representing the Bursau of Construction Representing the Bursau of Construction Repair and Naval Constructor Humsaker who had just returned it am abroad where he had received every opportunity

soris, with whom were associated Assistant Nava Constructor Humsker representates the Bursau of Construction Report of Nava Constructor (Inc.), Commander), H. C. Rithardson, Commander Richardson was responsible, particularly for the boat hull a most important feature in a successful flying boat. The use of a short type of hull with the tail supported upon it by means of an auxiliary outrager construction was the suggestion of the Curtise people and was based on a small flying boat which had been already built by them.

Speaking of the details of the design it cannot be ascribed to any one person or organisation wherever an idea of value was picked up or was brough notice of the designers it was studied and if found useful adopted in fact the widest catholicity of spirit was used throughout the whole enterprise. The Navy a showing or spirit was seen unroughout the whole character in the as for making, in experimental sentence, in grant greatly sheever it is due as for message, in respect to many of the most important structural details such as the rhs, wing posts compression structs and wing beam which are generally smallar to those of the first deep-Fage might bombing arphanes definite information regarding these details having been obtained by Naval Com governly(amiliar to mose or the resource-rage man common anymore scenible information regarding these details having been obtained by Naval Constructor Westervelt during a recent trip to Logland
Early in the development of the enterprise, the first large flying boat was designated as the NC-1 in which N stands for Navy C for Curtiss and the

sesignated as the Novil. In which a standard Novil Cor Curtus and the figure I indicates the first of a series of boats of this class. It was in December 1 and the figure I indicates the first of a series of boats of this class. It was in December 1 and the first of the construction of four NC boats and because of their great ase, the Navy Department errored a sperial building at Carden City for the building and assembling of the boats two of which can be assembled at one time in the building.

The first design called for a bost of 25,000 pounds gross flying weight, with the following dimensions

Span 140 th area 3 370 aq ft loading 7 5 lba persq ft weight 25,000 lbs, load 25 lbs per B H P (normal power) fuel 8 250 lbs or 15 hours erew 1,000 lbs or 5 men margur 750 lbs or 15 hours useful 10,000 lbs maximum

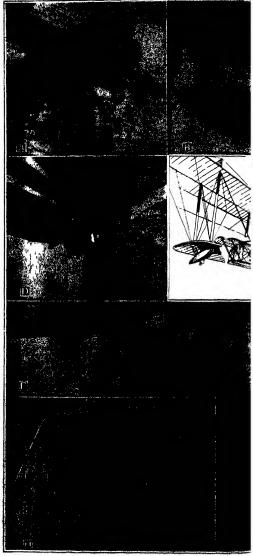
When the design had reached the point where it was possible to estimate its resistance and speed it was found that the three Laberty engines would not

reservance and speed it was found that the three Laborty segmes would not develop selfin sum power to obtain the descred results, and the weight and develop selfin sum to self the selfin self

cause of the great size of these craft it was early realised that if they were to be built without serious delay it would be nonseary to construct them on the assembly basis. Under this system the different elements were given to magnifacturers who already were turning out a product of a somewhat similar manuscrumen who arready were turning out a product of a somewhat similar anature or a product requiring workmen of qualifications similar to those of workmen ordinarily employed for work of the nature contemplated. After the various parts had been ompleted they were to be shipped to Garden City and there assembled into the complete flying boat

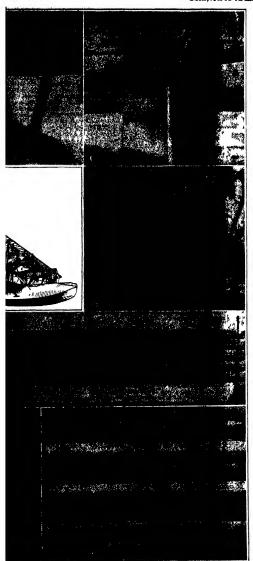
## The Boat Hull

Inasmuch as Chief Constructor Taylor in the memorandum referred to maximum at cumerical specific production of the memorandum control of



mpt. F. Administry at quader of surviya.

2. Francowith of the radius, I, Ou



space and book. Center Steech Key drawing of an NO Sping book. E Junction of ner monden again visited form the three-sided owingsor trees.

strong and yet extremely light for its strength and such it is. Two strong longitudinal trusses are incorporated in the structure, of the hull and through them, largely are the heavy dynamic stresses due to landing in rugh weather, distributed throughout the lost. The cross section of the immerse I portion of the boat shows a V-section which runs right up into the st in and serves an landing to cushon the impact of the as. Cut trary to popular thing the third the land of the state not a great obstruction to swift | issued through the hall is not a great obstruction to exist; awage through the air. That is to say the head restance is not great. It has been to the fact that its form was designed to present the minimum air restince when in flight and in this respect it is believed to compare to tally with the resistance of the landing goar for an ariphase of the same weight in less: I unfur more the hall was designed with a view to securing a positive vertical traction when the instance is in flight. As a matter of fact the wind tunnel tract of a model of the boost designed with the lefters of fact the wind tunnel tract of a model of the boost designed. showed an actual lifting effect of several hundred pounds at full speed

# The Wing Structure

As will be noted from our illustrations the wing ribs are built in the form of triuses with vertical and diagonal insubs is and the brains are of hollow box-gorder construction. He meaninum depth of the wing is about 14 inches Their chord is 12 feet. The strute are of hollow built up sections and show a careful attention to stram liming. Those who are familiar with the Handley-Page constructon will see many points of broad resemblance

#### Special Details

It is scarcely necessary to say that in the hands of our Naval constructors and the staff of the Curtiss Company nothing in this powerful machine was left to mere guesswork—lust as in bulge design a skeleten strain sheet is drawn up with the maximum stresses indicated on every chord post disgonal tie, etc. so in the NC's the stresses were accurately determined and care was taken that nowhere should the clastic limit be exceeded. In order to handle taken has nowner as much in classic matter extended in order to mande the first seed of the control of the control of the control of the first seed of the control of the control of the control of the control of the best in by a study of the dat his shown in Figure a D and F. To provide against crushing or froming up of the nots of the strutes or posts, the tested pockets which received them are first lined with soft sheet copport which, withing under pressure all we the end of the post to adjust thereff with a fairly withing under pressure all we the end of the post to adjust thereff with a fairly even distribution of pressure

# The Tail Outrigger

So large are these surplanes that one does not realize that the tail of the So large are these implanes that non-mode not require that the tail of the machine is a large in its if it is some of the small last southing land planes, and to carry it far to the train (it) both and the plants and hold it firmly in place and in line called for some very new designing. The ourigage poster of beams were constructed by several of our new twint builders who have had expensive in the construction of hollow masts for ricing yachts. These beams are hollow and are heavily wrapped at intervals to add to their strength. The thinness of the shell is shown in Figure I where several beams which have been tested to destruction see lig I are shown out in two with the severed ends presented to the camera.

# Fourth Engine Added

The first of these flung boats was completed in October 1918 approximately one year after the commencement of the deep nat was first flown on October 4th it was apparent at once that the boats would be successful beyond the expectations of the designors. It was understood that had there been time to build and metalli grant-down engines for these boats, their performance would have been materially improved but it has been implementable to produce engines for these boats, their performance would have been materially improved but it has been implementable to produce engines of this type of sufficient propers under the stress of war work and as yet no such engines had been made available. Hence it was necessary upon the approval of the trans-Atlantic project to materially modify the engine arrangements and install a fourth engine. This was necessary to the engine arrangements and install a fourth engine. This was necessary to secure sufficient gasoline capacity to carry the boats over the longest stretch scure sufficient gasoline capacity to carry the docts over the longest attended to the proposed trans-Atlantic flight house to a sufficient proposed to the proposed trans-Atlantic flight house to a sufficient proposed to the flights was done at the Rocksway Beach Naval Air Station, where special hangar and handling arrangements were provided the station so an anarow peninsular on one sade of which is the Atlantic Ocean and on the other the smooth water of Jamaica Bay which latter affords water landing in any weather while the nearness of the ocean makes possible the carrying on of ocean sea tests with minimum difficulty. It should be mentioned that outside of the long flights made in the train-Atlantic attempt on November 24th of last year one of these boats broke the world's record for passenger-carrying by making a trip with 51 persons on board

# Seaworthmess Must Be Improved

When Admiral Taylor in his memorandum called for special attention to when somes a system in a memoratorian consideration as seen in a secondary to seworthme or of the ability to keep the seen as against keeping the air he laad his finger a the event was to prove upon a most important dement in a transition for in the last the proventies of the system of the secondary of the weather that for a boat to get through without risk to its frought. instanty of the weather that for a heat to get through without risk to its freight or passengers it must be prepared to come down and take whatever comes the way upon the surface of the water. Not I and No 3 were put to this tead, and so far as information has been given out it looks to have been quite a severe test, one of the boats sunking while it was being towed to port and the other, pluckly) navegated by Commander Towers though it succeeded in residency port, was so badly wrecked that it had to be dismanded and sent home. The damage in the/see of one book seems to line be in due to the inertia of the center part of engines proving too much for the straight of the strate which carried the tenter of the center of the

(Continued on peer \$18)

# World Markets for American Manufactures

Edited by LYNN W MEEKINS

A department devoted to the extension of American trade in foreign lands

## Progressive Venezuela

POURTEEN years ago the agent of an American manufacturer of fain implements stopped in Venerate on his way through South American Ventuag Caracos the capital of the rejubble he met the president and was invited to inspect the tonlefe con evite. Fairn not far fram the city. This trip resulted in the sale of word mowing machina is the hardly any other business was done by the agent in Venezula. Onsequently his company discided that other markets are more promise company desided that other markets are more promise. A number of American firms has ding various lines had similar experiences and ip to five years ago the volume of our trade with Venezuela was comparatively

It has been more difficult for American exporters to sell goods in Venezuela than in other countries largely because of its customs regulations. Great care must be exercised in making out consular invoices which have to be in Spanish. It is necessary to list each item exactly to be in Spanish to be the spanish the increasing to mark a first and since and it is described in the Venezuelan tariff law and since are imposed for the use of ditto marks and abbreviations. for all errors I specially noteworthy is the that making shipments with drafts attached to docu-ments gives no socurity for the consigner named in the consular invoice can obtain goods from the customhous-without presenting invoice or bills of lading. In recent years the establishment of branches of American banks energels has helped to evercome this obstacle. Import duties are levied upon gross weights which must be marked upon all packages in kills (A kild is about 2.2 pounds). That means the lightest possible packing

# Trade Leaping Over the Hurdles

The barriers just mentioned have not prevented our sales to Venesucla from more than doubling since 1914 With the high market price of ceffee in Venesuela at present there is every prospect for materially increasing trade with that country. We have most of our southern neighbors chief product and naturally we should like to keep our high place in Veneziela s import business. In this connection the following statement of a commer-cial agent of the Venezuelan Government sent to the United States upon a special mission is encouraging Venezuela is more interested in developing trade with the United States than with any other nation We have a very cordial sentiment for your country and my Government desires the extension of commerce

This envoy will recommend changes in the customs regulations that will make it easier for the American shipper to deliver his merchandist in Venesuela. He is conferring with the principal business men of the United States in order to learn the reasons for their failure to give based in the south of the same time that the great need is a rapid passenger and freight service from New York and New Orleans to La Guarar the principal port of Venezuela about 2000 mules from each. In the past it has been possible to make the trip from La Guarar to Lurope a much longer voyage in the same time as that to the United States American capital for the develop-ment of agriculture (attle raising mining and other industries will be very helpful in stimulating the sale of our manufactures in Venezuels. We want your busi-ness men to communicate with ours and to study not

#### only the riches of our soil and the opportunities in our trade but the paculiarities of our commerce and of our psychology said a recent visiter from Caracas What We Can Sell and How We Can Sell It

The principal groups of buyers in Veneziela are the overnment—the petroleum and coal development (rovernment companies the large importing firms and the retail merchants. There are less than 600 miles of railways in the republic. More lines are needed to move agri in the republic cultural and mineral products to the sea and to open extensive tracts for innugration. The Government is also improvement such as graders rotary sifters stone crushers and other equipment. The expanding highway countries and other equipment. system will require numerous bridges owing to the many rivers that must be crossed. Existing bridges are said to be narrow and inadequate and these must be replaced with better structures One of the best bridges in Car-acas was constructed by an American company Public improvements of this sort are paid for by taxaton and not by bond issues Generally speaking, the Govern-ment requires orrelit for six months or longer It is reported to be in a good financial condition at this time

Iwo American corporations have opened petroleum wells in the northwesters part of Venesuels and another American company holds a valuable coal consection in the Maracalbo dustrict These and additional enterpress import large quantities of such commodities as preserved foods iron and seed manufactures, and of the import trade of the sountry was controlled by the company of the company of the controlled by the company of the controlled by the controlled by the company of the flower of the sountry was controlled to the flower of the controlled by the controlled segment advancing money on crops and on agracultural products stored with them, which they purchased or sold abread on commission On the contrary they bought from foreign manufactures in a cash beass sching to the Venesuelan retailers in their own terms

# Dealing Direct Brings Best Results

Besides being the capital and largest city, Caracas is the center of commercial settistics in Venezula Practically every company engaged in business in the republic maintains its principal office in Caracas and all general agencies should be located there. Simewhat more than a year ago an important American mercantile firm estab-lished a branch house in that city. Jarge stocks were carried from the start and business has increased with startling rapidity because this branch can sell to smaller marchants much more cheaply than hean sail to smaller merchants much more cheaply than they can import for themselves On the other hand one of the American banks in (aracus will take orders f r goods and deliver them at the purchasers warehouse with cost freight

them at the purchaser's warehouse with cost irregart
insurance and duties paid

The standing of Venesuelan firms is high and excellent
results have been attained by many American manufacturers who have granted them seeners. This is
especially true of distinctive American products.

There is no question that the most affective manner of expanding our sales in Venezuela is direct representation ing our sales in Venezuela is direct representation, a through either an American Branch louse or assponsi-ble native merchant The Chamber of Commerce of Caracac composed of the most substantial business man in the capital will supply credit information to American exporters. It is essential to attend to the regularition of trade marks before seeding goods to Venesuela. This affords protection for a period of 30 years.

# Shoemaking a National Industry

Shoemaking a National Industry
Imports of shoes from the United States are imagnificant because of the very high duty \$274 10 per 100
pounds gross worsh' which review the loved industry
Upper leather and shoe finglinest burchesed shroad, but the soles are made in Yessenth purchased shroad shoes bring from \$12 to \$20 per peir in the review of the shoes bring from \$12 to \$20 per peir shoes the per sheet quality
of leather costs only \$7 Italy France and Great
Britan manufacture most of the hate sold in Venezuela
Span supplies most of the honery Good shurts made
locally were to be had for \$15 00 during the war, thus locally were to be had for \$1.50 during the war, this price will probably decline to \$1 in a few months. An American firm has sold fair quantities of wearing

apparel and other merchandise in Venezuela by parce post This method is growing in favor primarily because no consular invoices are required and there can be no customs fines for mistakes in documentation. Our customs fines for matakes in documentation Our parcel post business is likely to suffer however from European competition, because the rates from Great Britain France and Italy at the lower than those from the United States A Venesuelan law that requires the panting of the fronts of all houses in La Guara and carness each year in May, just before the national congress meet is a factor influencing the steady importation of colors and varnishes. In 1918 more than three control of these materials class from the United States which we have the control of these materials class from the United States made with oil. Importing seed, in the part of those made with oil. Importing seed, must be sufficient to those used in the United States.

# Increasing Our Sales Force

MoST young Amencasi have a dozer to see the world, but those whe go abroad usually do not remain region in foreign dilates. The good ald United States as the best country in the universe to live in said to work at The result is that comparatively few American discuss take up their jerranent rendence abroad country in inside our foreign trude, for all our country of the country in the country of the country o

Until American manufacturere eas areas ellegislasty a sufficient number of young men to represent these in other countries, they would do well to say attention to the sore of sea direct and to be secured from the American insection to the sore of sea direct and to be secured from the American sensionary in India became microscopic area as a present in the United States. For instance, as an apresent in the United States. For instance, as American miscionary in India became microscopic in American miscionary in India became microscopic in India and machinery Eventually he was appearined agricultural development of American miscionary in India director of the important nature saise of Creation, when a large as West Virgmis. Thousands of collars worth of central India because of this man a efforts.

The average American issuries starts out with the idea of pleasure brown a great deal of pleasure from attending to just a study business, and if the or more of the laster. When some American measuricetyrary go abroad, however, they denive a great deal of pleasure from attending to just a study business. And of pleasure from attending to just a study business. And of pleasure from attending to just a study business. American product—and finding it delectable. Then there was the watch manufacturer who took a trp to Such American product—and finding it delectable. Then there was the watch manufacturer who took a trp to Such American product—and finding it delectable. Then there was the watch manufacturer who took a trp to Such American product—and finding it delectable. Then there was the watch manufacturer who took a trp to Such American product—and finding it delectable. Then there was the watch manufacturer who took a trp to Principal jeweity force. to the Panama Canal and thence back to New York He stayed in Bussons Aires for sweral daws and vasted the principal jeweiry stores. The watches that he saw were the ancent hunding-case timepone that used to weight so heavily in our pockets. American watches of up-date design are being sold in the Argentine agaptat boday. The American massufacturer was told that they weight designed but he was sure that they would find fare—and they did. The same thing happened in Valparame

# Those Who Come to See Us

they did. The same thing happened in Valparamo
they did. The same thing happened in Valparamo
they did. The same thing happened in Valparamo
this opinity whose services may be enlisted. A young
the same of the same the same the same thing of the stablanding of a bad libeaut term in an article types
the same the same that the same time to plans for the estabishment of a bad libeaut term in his native city upon
the same that the same time to plans for the estabtions will be purchased from Mont, if not all, of has
totok will be purchased from Mont, if not all, of has
totok will be purchased from Mont, if not all, of has
there than that, he will carry back to Breatl a blaing fee
hundreds of our goods, and has father, who owns a lagetherefore the same that the same than th

# Mechanical Equipment of the Farm

Latest decelopments in agricultural machinery and practical suggestions for the farmer

Condessed by HARRY C RAMSOWER Prefessor of Agricultural Brit neering. Otto State University





Leading the hay on a mevable rack and shifting the lead forward so that the rear half of the wagon may be loaded

# A Movable Rack For Leading Hay

A recracte mack For Leading May
A NYONE who has had experence loading hay after
a hay loader knows that it is not an easy task to
fork the hay to the front of the wagen and properly
place R. Two men are required on the load if the work is
to proceed as it should. The device shown on this page
allusigness an effective way of overcoming tha
A movable rack half the length of the
wagen rack is mounted on a track made of
two-by-down spiked or bolled to the rack.

wages reacts moutes on a set of make of reason. This movehly neck has four finance. This movehly neck has four finance and the move of the reach has four finance and attacked as shown in the libraria and a standards. As shown in the libraria constitution of the rear and of the wagen rack and looked to that till beight By means of a standard the rack is unlocked and per mitted to move to the frent of the wagen I would be standard the rack is unlocked and per mitted to move to the frent of the wagen If the local will usually run to the front when the team stope. Some ring are provided with a rope, and policy connected to the front forward doubtle the wagen be stopped on an up-grade. After this portion of the load is run forward the rear half of the load is put on.

put on The idea is to eliminate the second men on the load. The experience of a number of framers inclinate that there is a real saving in labor and the vig is especially ap-procheded by the small farmer who en-deavors to do the most of his work numerif

desvore to do the ment of his work humself. On the other hand, the leage farmer can use two vegoes, keeping one in the field at the leader, while the wild he had been to the hand of the leader of the hand of th

siderable task. It is, of c irse done very largely by machinery and improved methods are constantly being meahinery and improves memous tre consumity oring sought. And now, in the actual cutting of the crop the farm tractor is to be it troduced. This is made feasible by a harvesting attebuent which is shown in the accompanying Rheisteit in recently invented by C. J. Gardner, a farmer-use hime of Huntington Heach

The one-man rack for leading hay

Cal The attechment, which is fastened to the front of the tractor for pasting, outs either two four or mx rows of beans at the same these, self in addition to ruting them leaves the even the even the word of the tractor of the even the e



runner may be raised it I world to place the knives at any required close to while a lar parallel with the kindo seasism in his wint wing. If has been found in practice that cuth ren to write rinners may be used each harvesting two rws of beans and auturally d a rinners in vie a jet layest operate

naturally it a rime rem vie up of iso as I operate at various lists to a part.

The my into many those leases if ref the harvesting for us into me sarrie, and samular rips and is life vine of uptable to a simular rips and is life vine of uptable to the harvesting for the line with the line of 
# Grain Binder Troubles

A T least 10 per call of the troubles en-countered in the 1 ration of a grain binder are confined to the binder head. The head contains the most delicate and

The heat contains its most deliate and compilated parts in 1b the theorem-compilated parts in 1b the theorem-structure and furnation should be thor-ughly underste silve the operation of the com-traction of the compilation of the common transless lasted here, it will be necessary to examine a bin for if the reader is not already familiar with one. The com-mental run mentional is the same valued. alroady familiar with one The com-pressor arm mentioned is the arm against which the grain is forced by the packers, the trip arm is that part against which the grain is packed pressure on which operates the compressor spring and the trip spring, which in turn releases the dog in the clutch

at the front of the bunder head thus throwing the tying at the irrat of the binder need thus throwing the tying much hansan into grar. The trip trin and the compressor arm may be one and the sam piose or each may be separate. The twine disk is the revolving notched disk which is always held by the disk. The twine-disk the twine is always held by the disk. The twine-disk apring court is the tension with which the twine disk holds the twine. The bill hook is the

tying device proper across which the needle controls the tension with which the hoop grasps the twine
In order to increases the size

In order to increases the same or the bundles it is necessary to move the com-pressor arm out on its support bracket To increase the tightness with which the bundles are bound it is necessary to tighten the compressor spring and sometimes the trip spring. The twine tension should never to tighte ned for this purpose. Some of the common troubles are listed

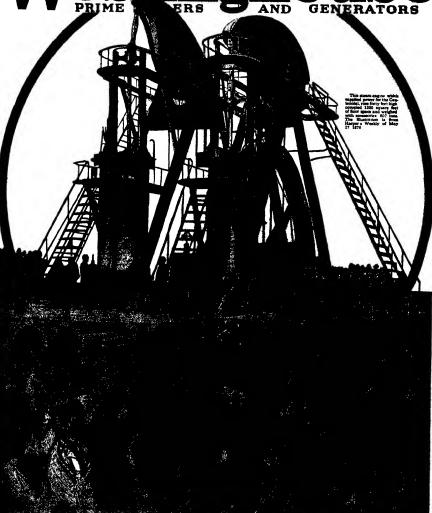
as follows

as lonows

1 Loose Turne Disk The twine disk
should hold the twine so tightly that a should hold the twine so tightly that a pull of about 50 pounds is required to drawit from the disk spring. If this spring becomes loseened two conditions may be ment with (a)A band may be found clinging to the hill-hook with a loose knot clinging to the nin-nook with a loose knot in the end while the free end has the appearance of having been cut aquarely iff. The trouble here is that the twine-disk spring was so loose that it released one end of the twine but the other end was placed.

(Continued on page 816)





OUR CENTENNIAL PRESIDENT GRANT AND DOM PEDRO STARTING THE COLUMN SECTION A SERVIN SY THEO. R. BAVE.

# Westinghouse AND GENERATORS

# Dwarfing the Giant's Might

When President Grant started the mechanism, and the mammoth Corlies engine in Machinery Hall began to throb with life, crowds at the Philadelphia Centennial witnessed what the world in 1875 proclaimed the crowning glory of steam-engine development.

Today, scarcely more than two score years later, Westinghouse Steam Turbines, in size but pigmies beside the "grand mechanical monument" of 1876, are producing five tings the power from the same fuel—power that lights great cities, turns the wheels of countless industries, drives thing across the seas and performs various other important testis.

With all its great size—it occupied \$4,000 cubic feet of space—the Centennial stant delivered 1400 horsepower. A Westingstrase Turbine of the same capacity would require but 115 cubic feet.

This advantage alone makes the steam turbine one of the out-standing achievements of the past quarter century. Because of the, the public annually saves millions of dollars.

To the ship-owner, this economy of space means more cargo—to the shipper quicker service and lower rates. To central stations and electric transportation companies it means greatly decreased investment in real estate and buildings or less expensive expansion—to those who use electric light, heat or power, it means cheaper current, to those who ride in electric cars and trains, low fares.

The steam turbine, moreover, has cut the world's fuel consumption by millions of tons a year, with incalculable savings in labor and transportation, and effected other economies

Westinghouse brought the Parsons steam turbine to this country in 1895, when it was still crude and imperfect, and through years of costly painstaking development, raised it to its present high degree of reliability and efficiency.

One important result is the Westinghouse Turbine-Generator for producing electric power.

Today Westinghouse Turbines and Turbune-Generators are made to develop from ½ kilowat to 70,000 kilowatts. Already they have accomplished a revolution in electric power-plant practice and they promise to do likewise in the designing of ships.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
East Pittsburgh, Pa.

A Westinghouse Tubrine Generator of thirty times the power as it would look beside the pride of the Centennal



# Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

# Plowing and Harrowing the Ground at One Operation

Will be view the simplifying the proportion of onl for planting particularly new ground which has not yet to a live and a least support to the second of the second which has not have not a second particular to the second of th

# Simple Clamps for Putting Derailed Cars Back on the Rails

IT is from the simplest ideas which prove the most ifficient and many of these simple it as arc the result of everyday experience with one swork.

But his the case with the invention of

Such is the case with thi investion of Wn (askis wricking master of the New York central innes resulting in Chicago Marchael and the control of the New York central innes resulting in Chicago and the control of the c

Herstofore the practice has generally been to apple creation on the tire. In many cases this practice only results in the destruction of much track without getting the ear or care back on the track Again, the wood of the tree is sometimes as soft that the replacer a sametime be given by the control of the control of the track and the properties of the rails brill trouble is expressed on the rails little trouble is expressed.

# A New Idea in Gang Drills

WHILE there is nothing new in gang
Wdrilling it has remained for Aaron
Itili of Los Angeles (al to develop
something new in this branch of laborsaving machinery. The result is a gang
drill which is expectally adapted to boiler
shops structural steel fabrication and
shurphies were

shopping work and the structure and shapping the shapping work and the shapping and the shapping work and the shapping work and the shapping which are shapping to be presented as the shapping which are shapping to shapping the shapping who shapping the sha



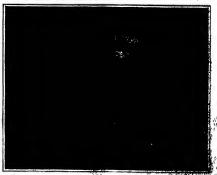
Novel type of plow invented by a Las Angeles man and tested with good results

gered to distribute the load over the several chains provided, and the web of the drill carriage forms a lubricated runtnother radical departure in drill design are the drill haads arranged as independent detachable units. Each unit



Simple ratchet clamps which serve to hold car decallers firmly in piece

way for those roller chains and serves to prevent the chain from slapping off the sprockets while in regular operation consists of a small bridge casting which straddies the chainway, and is machined at each end in order that it may slide



This gang drill, with fifty delanguage and adjustable drill make, manufacture

casily along the sarriage rails. In many other respects talk new gang drill is

Amondming to its inventor, it will residuous the nose of slabor to an average of 250 per cont, sessment with the present gathed of punching and assumbling. It will residuous the nose of the continues of the con

#### Notes for Inventors

Safeguarding Roll-Plim Expeditors.
—There have been see many invanished of late bearing on the prevention of deather supports on 101 files, that it seems high short time before some make of course, because the second of the seems high short time before some make of course, because one of the most freely marked and the second exposure on the significant section of a locking device sengaling with the film winding metchanson in such a manage final southern second exposure on the significant section of these sengaling with the film winding metchanson in such a manage final southern section of the sectio

Senirary Disk Mop.—It has remained for Willard Roid of Eveneton, IV. Senirary Senira

A Tricky Bull.—By making a best with a plumby of plumby of plumby of plumby of the property of the property of the plumby of the

# TIMKEN TAPER



You can always recognise a Tinken Bearing by its taper tapered rollers revolving about a tapered cone within a tapered cup. To the taper is due two things that havis given Timken Bearings there supremany in passenger car truck and tractor.

1 Resistance to wear — because a tapered roller bearing resists end thrust

the aidewise pressure of the vehicle's weight as it rounds a curve just as well as it does the steady downward pressure caused by gravity

2 Take up for wear — because when the surfaces of cip cone and rollers become slightly worn a part turn of an adjusting nut brings them together again and the bearing is as good as now

# plus Timken Tubing

'At the rate you're piercing those bars and rolling them into tubes," said one tube-mill visitor, 'you ought to have enough soon to make bearings for all the ears in the world"

Other visitors to the Timken plant at Canton have thought the same thing when they passed by the bins of stock tubing housed in long sheds Millions of pounds of tubing there are here of all diameters from three quarters of an inch to six inches

Here is enough saw material at hand to make up cups and cones for any order of bearings of any size, and constantly this pile and that is being replenished from the tube mill

The careful control not only of the material in these tubes but of every process involved in piercing, rolling and straightening is essential to the maintenance of Timken quality

It is one of the many things that are added to the principle of Timken Taper to assure the resistance of Timken Bearings to the effects of wear





# Make Your Roofs

LEAK-PROOF!

You can make them absolutely watertight for ten years by coating them with Stormking No chance of failure for we guarantee results.

This seamless, asbestic coating is not expensive Cost of application negligible.

BUT -more important, it saves the expense of tearing off the old roofing

Simply brush Stormking Liquid over any roofs or trowel Stormking plastic over badly worn surfaces and forget them until 1929 No repair or repainting expense after Stormking—one application is sufficient

Send for full information and testimonials — it will pay you.

Special proposition for dealers Write

# Efficiency Products Company

\_\_\_\_





# The Current Supplement

OUR new navy is naturally attracting wide attention today, both because wide attention today, both because of its superor fighting power and because it is to try out on a grand scale the efficiency of electrical propulsion for the great ships. The ill fated Jupiter' was the successful small scale producesor in our nave and the present well illustrated article on Bitter or Propulsions for the U.S. S. Aces Micro will give us all a better dees of how the electrical organizer has men the mobilement. th electrical engineer has met the problems set him in this new field. Another paper in the Sciparing American Supilement, No 2266 for June 7th 1919, with navi interest is the first of a series dealing with Re est De clopments in Marine Lighting wherein are discussed the features of odem tended and untended lights and light ships A long article by Prof Nage-otti discusses Organic Matter and Lofs a sul ject he has investigated by studying the peculiar history of the development of the conne tive tissues and their immigrant cells. Dr A Hrdlicks gives us the benefit of his long study of the peoples of eastern Europe in an illustrated article on Rocce of Russia An illustrated article describes interesting experiences of a French biolo gist in raising and studying A Grant Insect, a tropical walking-stick measuring 15 inches in length Shorter articles discuss Electricity and the Nature of Malter, Zinc and Aluminum Alloys a simple type of con-verter unit for The Oridation of Ammonia, and an account of the Government a expenence in Packing for Export during

# A United States Port in France

Basanan however, remarkable project as it was in conception and speedy as it was but in construction and opporation. There were many other ongeneer operations in Francisco to the construction and protections in Francisco to the construction of th

Brot had three entirely new berthal mighted these with Bassans, were all 11 till engineers made from the ground in the rat of the 80 nine at the time of the amments being more of less French in centru tion and more of less Americanised as time and necessity dictated. Had the centru tion and more of less Americanised as time and necessity dictated. Had the thin which the second of the mighted and on all but one of the projected constructions work had alwayd, be n started Of course the armistics in midstiffy brought a consistent of work had alwayd, and the second of the s

complicated that we was considered as a considered with the Montain property of the Montain property with piling driven for 850 feet the full width of the dead, and most of the piling capped. These of the sight berthe contemplated were released flatigated. The Talmont project was to be a 10-1 beat affair, of the seasoned language of the seasoned as the state of completion on Montain project was the seasoned of the artistics. The common of the artistics of completion on Montain project was the seasoned of the artistics.

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June 7, 1919

will not gloss but prospers between the standard for the stand. Under prosperity of unchasites a landarder in factories because of their understood grant for falder "Schiefer and Core of a Grindston

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# If Horace Greeley Were Alive Today

Would be advise young men to go West or would he advise them to take advagtage of the opportunities that abound in their immediate vicinity — Knocking at their door" as the saying goes. Undoubtedly he gees. Undoubtedly he would teil them that every-where is this ba and prosperous country there is opportunity for the young man who well use his brains, acquire knowledge, and get

Let use tell you of at least one opportunity right in motor own town.



and barracks had been erected a steam shovel was at work piling and timber had been assembled a 1 500 horse-power light ng plant from the States had been receive and was ready to creet 2 000 men were a work—and then the armistice Talmon would have provided space for the heaviest draft vessels and allowed 10 000 tons

day to be unloade !

Just what is to be one of the dock facilities en ct. l taken over improved Americanized is something which no or seems able to say It would seem far more logical to sell the whole to the Fren ! than to attempt to salvage the material f transportation hak to America can be ne salvaging the lab r which we into these projects and no possible way other than sale to the French of recovering even a small proportion of the money spectup on their development. Doubtless son equitable arrangement will be made by which the French nation will benefit by the American work and the French ports.

the American work and the Preach ports in the future possess a degree of American officiency in unloading which will be blest of mariners for generations to come! But such speculations belong to the concornist not to the reporter It is impossible to find an engineer who does not regret that his branch of the service of the control of could not continue to function and to show the world what we can do when we try — It is more implicable to find any who regret that what stopped the work was the defeat of the enemy

The effect upon the commercial methods of France of this influx of American spec i and efficiency in dook and unloading methods is not for consideration bear methods is not for consideration be What may perhaps be noted as a matter of passing if currous interest is that there is hardly a dock in America with the capacity or the speed of those America has ere France and that if we have the right to show the French engineer with some prid what America has done to his water front what American a sound to mis waser tour back in asking us why we have for so long and in so many places put up with outirely inefficient methods of docking and unload

ing in our own ports

But that perhaps is also something
which belongs to the economist Suffic
it here that no American concerned in the making of the American ports in France no American of our 2 000 000 who has been served by them and none of the hundred nullions who stayed at home but has a real right to be very proud of what our engineers did on the coast of France and a real right to feel that no matter how much Europ may call us a nation of boasters we have in this particular at least fully demon strated our right to boast of our engineering ability ingenuity and efficiency

# Killing Weeds With Live Steam (C mitnued from page 589)

prevent the steam from escaping and the boards from warping Hoop iron is fastened around the dges so that the pan

Instead around the dogs so that the pan hugs the soil closely and so that the steam will not seep out. There is an opening througl one and of the pan through which the steam is admitted. The pan is provided with ring both near the corners so that it may be easily moved. The steaming may be done either in the spring or the fall. The disadvantage in fall steaming is that the beds may become fall as the steam is the steam panel of the steam and the steam panel of the steam and without frost in order that steam may penetrate the ground. Class-covered beds may be left on for a few weeks before seeding time in order to dry the beds set Sample. time in order to dry the beds out times when good weather is encountered in the spring the steaming will be carried on for 24 hours at a stretch

After a bed has been steamed for minutes the pan is moved along to the aget point. The steamed area in the menatime is covered with a blanket to conserve the heat. Two pans may be used, one being left on the soil a half hour





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Few people realise that the reur axis of an automobile is next to the entire the moving a good automobile is next to the entire the moving a good automobile. The extract in producing a good automobile. The extract power is remainfact to the rear diffring wheels through the pinhou goes of the properly all through the pinhous goes of the properly all and different fall modalishen—all part of the

Other may better understand the importance in the may better understand the importance in the manufacture safe specific and the property of th

chanically correct and physically perfe-ted the rest art when it is said there are over the rest art when it is said there are over into that must be credibly suchined and intention to intended the said that the said intention to intended the said that the said strength to trained the power of the entitle strength to trained the power of the inten-tion of the said that the said perfect that the said that the said that the rest is surveived in this said to the said that the said that the said that the said that the rest is surveived in this said that the said that the said that the said that the said that Made in three transits of said that the said that said the said that the

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has been found that 30 minutes' steaming will heat the upper two inches of sell to from 20 to 212 degrees Fabrenheit. At there to four inches deep the thermometer will register 170 to 180 degrees, and at ax inches 120 degrees Two hours later the semperature at six inches, 11 has been

temperature at six indexes, it has been found reaches 100 degrees

The cost of eteaming 1,000 square feet of six is shout \$80. It is figured that the saving in cost of weeding will shout pay for this. It is also necessary to use less for this It is also necessary to the fortilizer on sterilized ground than on tensic ribred. The seed may be sown safely steaming the beds. While 12 hours after steaming the beds While the plants seem to be retarded at first, there is later a decided growth, so that they are ready for setting out two weeks

## Much Wheat -No Corn? (Continued from page 600)

Il g raisers are evidently secure in the feelug that there is plenty of corn in sight N w for the last comforting straw There are always two factors in the produc tion of any crop, acreage and yield per acre. Nield per acre is a great variable acre held per acre is a great variable Climite rainfall, temperature, drought, wind frest they all affect the yield

But the variation in the corn crop in the veries between 1910 and 1918 are the variations between 2,446,988,000 bushels in 1915 and 3 005 233 000 bushels in 1917, in 1910 the crop was two billion eight hui Ir d uillion in 1918 it was two billion five lundred million bushels. Corn has been a constant, not a variable, in spite of war in spite of the increase in the price of wheat in spite of everything. Not quite accept millions more acres were planted in winter wheat this year than last There were 12 million acres difference between wheat a reage planted in 1919 and 1914 het in variation in corn planted between the nearest years to those for which figures can be had, 1914 to 1918 was the difference can're nad, 1915 to 1916 was no disrevence between 103 and 107 million acres and, in the amount reaped, the difference between two lillion are hundred millions and two billion five hundred millions bushals If twelve million acres planted in wheat made white difference in over harvested why should seven millions planted extra this year in winter wheat make so much

this yiar in winter wheat make so much differen in corn to be harvested?

The Department of Agriculture will verture no opinion. But all its reports, while he set shy of figures, show one our against the corn situation. Loss wise than it is and much holder (as the fool must always be who rushes in where the angels wont walk) the present writer is quite willing to predict that the corn crup this year will not be a factor in raising the pinc of meat, either by its scarcity or its unusual size

## American "Mystery" Ships (Continued from page 600)

through an arched pipe over the propeller, so that the former would not become tangled in the whirring blades as they sped through the water

projecting arms were attached to

the slevice one on each side and near the forward end of the tube. The arms were buoyed by air chambers along their lengths and they carried drags with grappling hooks fur the purpose of picking up any anch red mines in the path of the ship Each arm was about 25 feet long, so that lacch are was about 25 feet long, so that lacch are was about 25 feet long, so that lacch are was about 25 feet long, so that lacch are with of the drags was ample to profess the profess of the profess







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drags It is obvious that these arms sacountered considerable resustance as they appead forward through the water, and the little rudders placed at the proper angles would keep the arms extended

This mine drag system was applicable to all types of vessels operating in danger-ous or hostile waters. It was simple and cheap in construction easily operated always under control.

Although the German U-boats reached American waters and were successful in surking a number of vessels operating on this side of the Atlantic by some chance of ill-luck our decoy ships were not in the vicinity of the submersibles when the made their attacks. Of course with only two decays it was rather difficult to guard the entire coast line of the United States The commanders and crows of the myster, ships were very much disappointed that with their excellently equipped vissels they were not able to sink a single seri unting season was open for Germans

# When Freight Cars Bump

(Continued from page 602)

its lowest position, until the shank of the its lowest position, until the shank of the draft gear is in contact with the face of the hammer. Then the hammer is pulled back until its center of gravity is raised a certain number of inches, and suddenly certain number of mehos, and suddenly scleased II swings downward and gives up a part of its energy as a hammer blow on the end of the draft goes thank. The draft gear absorbs a part of the energy delivered to I and passes the romainder on to the car, which takes it up in the form of motion. By means of the autographic record of the chromograph, the autographic and velocity of the car may be determined as in the tests previously described, from as in the tests previously described, from which the maximum pressure on the draft's gear and transfer of energy from hammer to car may be determined. Blows of varying intensity are delivered by ad justing the drop of hammer from sero up to the maximum which is required to produce a full closure of the draft gear, or failure of its connections to the car

Blows from a 16-inch drop of the 15,000-Blows from a 10-inen drop of the 10,000-pound harmer have been delivered on certain types of draft gears producing a pressure of 870 000 pounds, but on other types of gears a drop of 22 inches produced a maximum pressure of only 186,900 pounds

# Stefansson in the Arctic

(Continued from page 608)

pologist by profession, and on his staff were specialists of note in oceanography, ter-restrial magnetism, marine and terrestrial biology, geology and topography There was stored on the "Karluk" a most complete and varied collection of scientific instruments some of which could not be instruments some of which could not be duplicated is uch as the oceanographic instruments loaned the expedition by the Prince of Monaco, an oceanographic of reputation Most of these invaluable instruments were lost on the "Karluk when the ship went down off Wrangell Island on January 11th, 1914, after drifting in the lee for several months Stofansson had left the "Karluk" with five companions on beptember 30th, 1914, on a hunting trip, expecting to be gone shout a fortsaight His party reached the Alankan mainland and never as with Karluk sgaia, the and never saw the Karluk again, the tee off shore breaking up and forming a lead which could not be crossed. Thus the explorer started off on his Arctic tour, which was to last about five years with simost no equipment He picked up a few

land party of his expedition, and proceeded Of metruments, Stefaneson carried a sextant and a mercury artificial borison, sextant and a mercury artificial fortison, prisamatic compasses, several watches, a sounding wire of 1,180 meters, deep-sex thermometers, a number of comeras, and two Mannheher-Schoenhauser 615 indii-mater (265-indii-mater (265-indii-mater) and a fire with Gibbs siddification, much used in Africas hust-ing and have a music evictory of 2,300 fpss. The watches were ordinary standard Absorbins interprison, which Stefansson

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obeniceal industry as manufacturers of capl saves brince then with our entry into i cit. I have it in his pyroxylin and coal tar chemicals. Label it point a generals, ascads and synthitic described our charm at mirror back grown must today in the Du Pont American Industries that, has developed the greatest chemical organizar in in America. At the present time 1200 graduate chemists, at all it has executed if the data number in the Lord (ASLES) in an industrie.

At the present time 1200 graduate chainsts at all ut ten-per cent of the total number in the United States are en ployed by the various Du Pont conjunies

lour great research hi intoins operated by the company's Chemical Department complying in the neighborhood of four hundred technically train t iron sic maintained by our com-pany to entry on experimental operations for the improvement of existing processes to find the means of utilizing our by products and the most economical raw materials and to develop

nees and the most community raw materials and to develop new products.

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says he has always found preferable to their the distribution figures and a second substantial and the second substantial and second se

spot in the Arc ics During most of the time, Stefansson and his men and dogs lived off the land and comfortably on meat and fish alone in the somiorably on meat and man alone in tase far North There were few metanose of fliness Three of his men became ill with earryy from eating stored food. When Stefansson compelled them to eat nothing but fresh meat they rapidly recovered the harluk was of course intended to

be the major vessel in connection with the expelling and although there were four experient a and atthough there were four other consects in the hands of the explorers, it was necessary to replace the lost ship It was in this way that the North Star, which we illustrate came to be part of the which we illustrate came to be part of the outfit. Flough materially smaller than the Karluk she turned out to be of greater value than any other vessel of the

## America Flies the Atlantic (Continued from page 605) Lessons of the Future

Great credit is to be given to the technical talent which was engaged in the design of these flying boats. The event has proved that if a set has not yet progressed to the noint where we can build boats of sufficient strength and radius of action to make a sure or same if a forced landing becomes necessary not even with all the naval ansatal ce in the way of destroyers and batti slips to keep in touch with weather conditions and to check the observations of the flyers and hold them to a true course Evid ally the flying boat of the future if it is t become a commercial proposition for the become a commercial proposition for trans oceanic flight will have to be a mu h stronger and larger boat, with a wider margin of safety in the matter of its radius of action

As w go to press, we learn that NC-4 has o n pleted her flight to Europe by a non-stop jump from the Ascres to Lasbon Thus to the navy goes the aerial blue rib-bon of the Atlantic The first to hold this bon of the Atlantic Ine may be condition may she long retain it in the fierce comp tition, which even now has bigun and promises to captivate the imagination and stir the pulse of mankind for many generations

# Grain Bmder Troubles (Continued from page 807)

(Continued from page 507) are cross the bill hook. Thus a knot was teed in or e end and the twice remains on the lill (b). A band may be found lying with a discharged bundle, there being a 1 see knot in one and of the string and the other end being cut acquarely off. In this case the twine disk beld the twine until the knot was nearly completed, fluit one end of the twine single out of the disk just before being made a part of the knot was not provided in the local control of the little of the local control of the little of the local control of the

nre other end being out squarely off. In stopping, the trouble is with the dog in the case the twine disk beld the twine is the binder-head clutch. When she wip until the knot was nearly completed, flut are releases the dog stop, a spring beltied disk just before being made a part of the which the dog should force is the engages the disk just before being made a part of the which the day should force it is engaged. A review Luke Too Light (a) If a proper hand with a knot in one end and with the band with the band with a knot in one end and with the band with a knot in one end and with the color end presenting the appearance of of the size that? The degree properties of the duck it too light When the bill-hoot; the duck it too light When the bill-hoot; the duck it too light When the bill-hoot; justed to remarkly the respitable provides, one can is spilled from the disk two long with the duck it too light. When the bill-hoot; justed to remarkly the respitable provides of the size of the si

The remedy is to become the differential enging.

3 Bill Spring Two Learn. If there is frome with a discharged brandle a brandle brandle a brandle brandle and brandle 
rusted bill will cause the same trouble
5 Teuser Tension Too I Pajit If the
twine tension is too tught, the difficulties
monotioned in 1 and 2 may be increased, so
much force being required to draw the
twine from the box that the sudden
passage of the needle upward pulls the
6 Norde Twouble II a bundle is
discharged with the twine actending back
to the needle up at is an indication that

to the needle eye it is an indication that the needle failed to deliver its twine to the twine disk As a result the loop and knot were made in the usual way, but only one end was cut off The disk of course was not threeded for the following bundle This trouble may come from the fact that the needle pitman does not permit fact that the needle pitman does not permit-the needle to travel sufficiently far for-ward though this is seldom the case. What happens more frequently is that straws or trash interfere with the proper placing of the twine in the disk. On the discharge of the following bundle the disk may catch the twine and the third bundle will be presently leave.

the twine and the third bundle will be properly bound .

7 Sewed Bande (Kingning to Ball Hook This is unally the result of several successive misses and may be caused by any of the preseding troubles are the following 1 Loose Dries Chase. If the main drive chain is too loose, it attempts to climb the testh in the small sproadest on the secondary shaft and results in a jerty motion. The tension should be tightened or a link removed. motion The tensi

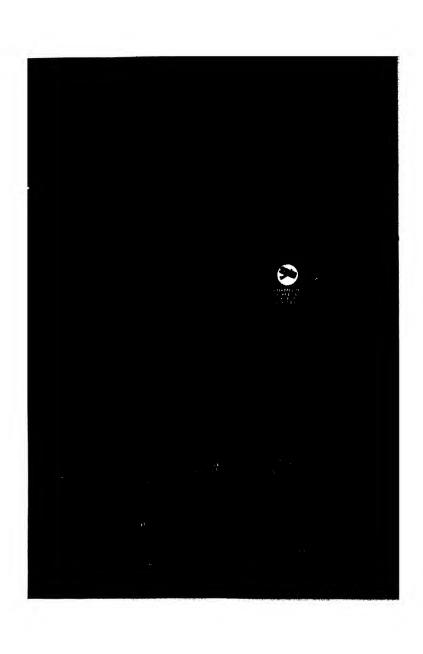
motion The tension should be tightened or a link removed

2 Creptus of cancess If the canvases are too loose or if the elevators are not squara, the canvases creep, that is, the slats do not remain parallel to the reference of the control of the



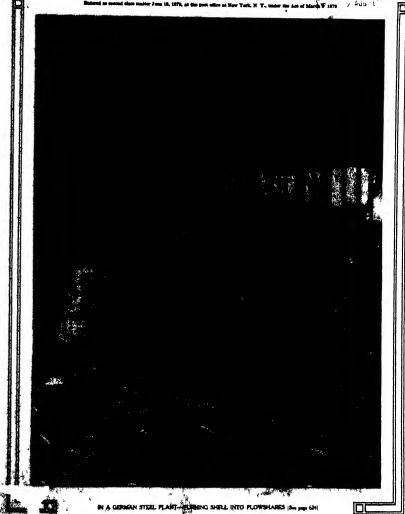
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IF you open your watch and examine its mechanism, you will find it consists substantially of two supporting plates, between which is mounted a gearing of meshed wheels to take care of the movement, recording time. This is called the train, which we will speak of in our next advertisement.

The lower supporting plate in a Waltham watch is the foundation upon which every unit revolves and is fixed. It is based with minute holes to take the pivots, screws, pinions, etc.

This lower plate is drilled and threaded by one of the most exclusive and wonderful machines ever designed by the genius of man—an exclusive Waltham invention from the master-mind of Duane H. Church.

Many operations are accomplished with such methodical, automatic regularity that one instinctively imagines that a marvelous human brain guides the extraordinary operations of this machine.

It makes every operation (and there are 141) with infinitesimal exactness to the ten thousandth part of an inch—flawless, beautiful in its complex simplicity—every plate a replica of every other place, proving Waltham standardization to be one of the miracles of American mechanical genius.

The plate of the foreign built watch is subject to the variations of him is placed back to variant area and models without process especially to the power which they are contain, which pers are made closed here is every source, and with the person of the

So when you buy a Waltham watch you are assured of a mandardination of quadrand leadership which has placed the Waltham watch be the partial of the placed.

Warman Colonial A
Extremely thin at no sacrifice of accuracy
Maximus movement 21 jewels
Riverside movement 19 jewels
\$135 to \$255 or more

WALTHAM

THE WORLD'S WATCH OVER TIME

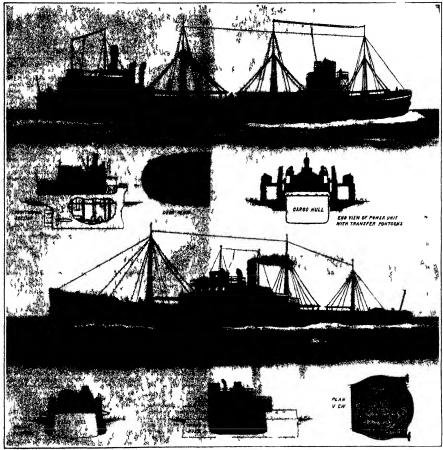
# SCIENTIFIC AMERICAN

# THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

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THE IOCOMOTIVE OF THE SPAS

& detachable power plant for the steamships showing two suggested arrangements (See page 628)

# SCIENTIFIC AMERICAN

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Charles Alie M I s Int Orson D Munn Treasure Allar ( 11off u Ser tary; all at 233 Bradway Sittered at U n 1 st n 1 f v v y rk n 3 as receif them Matter Trade Mark Register ( 11 c 1 teel Hates Take st fine (oppraint 19 y years 1 A red an 15 lishing to real tire a Table receif

The object of this journal is to second accurately and lucidly the latest scientistic mechanical and industrial news of the day. As a weekly jural it is in a poss tion to announce interesting detel pments before they are published elsewhere

The Edutor is glad to I we submitted to him timely articles suitable for these columns especially when such articles are accompanied by photographs

# Three-Year Naval Program Abandoned

L are gratified to note that in his testimony recently given before the House Naval Affairs Committee the Secretary of the Navy an nounced that the second three year naval program had been abandoned The SCIENTIFIC AMERICAN Was strongly opposed to this program on the grounds that it was both inexpedient and unnecessary-inexpedient because it would tend to destroy the excellent feeling which had sprung up between the United States and the Allies as the result of our participation in the war un necessary because the joint effect of the construction of our first three-year program and the elimination of the German fleet had unabled us to reach that strong position as second naval power which the great nationa movement for preparedness had set as its ultimate goal

Mr Daniels frankly admitted that the proposal to launch a second three year program was intimately related to the fate of the proposed league of nations and he cannot complain if the people of the United States believed that the movement was based more upon the political situation than it was upon the material and military needs of the United States Navy From the very day of the surrender of the German Fleet our Allies favored a policy of naval retrenchment which rendered the big-navy threat unnecessary. However the fact that the second program has been abandoned suggests that the (suvernment is satisfied that the eration of our Allics both in the matter of the league and of naval disarmament is well assured. If these great results have been achieved we believe that the whole nation will join with us in recognizing that the Prendent has perfurmed a great and noble service in the interests, not merely of the sorely stricken world of today but of humanity at large for all time to come

We have been asked if the SCIENTIFIC AMERICAN believes that the United States should possess a powerful Navy Most certainly we do and for ever a quarter of a century, as our files will show we have endeavored to awaken the people of the United States and its Congress to the necessity for building a Navy commensurate with the ever increasing population wealth and responsi bilities of this great republic. With the completion of the 1916 three year program we shall be in possession of a magnificent Navy greatly exceeding in power the Navies of the next three leading naval powers

And just here we wish to speak a word of caution It would be disastrous in response to the call of the country for a rapid demobiliration if we reduced the personnel of our Navy too greatly and returned to that state of undermanning and shortage of officers which obtained before the war. A ship half-man under officered is less than 50 per cent efficient A ship half-manned and fore let us see to it that our splended ships the latest of which are superior to anything affoat have every ad wantage that full crows and a complete staff of officers can give them

The 1916 three-year program which called for the construction of 10 dreadnought battleships 6 battle cruisers, and 10 scouts with a number of destroyers submarines and muscellaneous traft, was neglected dur

ing our participation in the war in favor of destroyees and other vessels suitable to meet the submarine of-feasive. It is that great program which the Secretary now wishes to push energetzeally to completion

Of the battleships, four, of 32 600 tops, are under construction These ships will mount each eight of the powerful 16-inch guns The other six will be even larger and mere powerful On a displacement of 43 209 tons they will mount 12 16-inch gurs and they will have a speed of 23 knots. They will be 684 feet in length, 106 feet in beam and their mean draft will be 3d feet These dimensions are for a battleship enormous at full draft they must displace over 45 000 tons

The six battle cruisers, 850 feet in length will carry eight 16 inch guns. The efforts of the SCIENTIFIC AMERICAN to have the original design changed so as to bring all of the hoilers below the pretective deck were successful and the modified plans show all the boilers be low the waterline As a compr mise on the debated question of building composite ships we suggest that the armor protection should be raise | 1 12 inches and the speed reduced to 32 or 32 knots

The 10 scouts should be built with all possible dis-Our navy possesses not a single scout of the fast type that did such fine work during the war

## Our Links with the Past

THE avalanche progress of a sonce in the past centuries justifies a most spinnisite attitude with regard to the prospect of future developments Nevertheless there are certain sp in kinds of problems the complete solution of which presents difficulties of an altogether peculiar character su is that we may well hesitate to extend to these the same confidence of succossful attack which we justly entert un towards other

subjects of scientific enquiry

Historical problems in particul r are thus baffling in character The time-worn face I the present has betrayed to us many a story of the pust written by the hand of man foresake us the archaeologust and the geologist have taught us t decipher the writing of nature upon the rock. The cut ry logist has filled in further details by his discovery that the development of the living organism from germ to adult stage epitomises in abridged form the history of the race. The ast perhaps can claim the greatest accuracy in his recon struction of the past as he is entitled also to our ad miration for his wonderful power f predicting certain future events

But after all the knowledge thus obtained is a mere patchwork of fragments in which the gaps far outweigh the positive data. Consider only our knowledge or perhaps we should rather say our comparative ignorance early history of our race and the descent of man

What consuming interest would attach to a reasonably complete album of our ancestors! Let we have to be satisfied with a skull here, a law brue there a few ornaments entombed with their erstwhile owner a primitive carving or the work of some prehistoric painter genius, the residues of a camp fire, and such relics as these as the evidence from which imagination and scientific reasoning must piece together here a chapter and there a chapter the early history of the human race

Nor does it seem as if in this matter the progress of nence could ever greatly help us More and more will undoubtedly be learned of the past But the number of fossils shrouded in the earth s crust is necessarily

Only a diminutive portion of all living beings leave recognisable permanent trace after their death. Unless science should discover some altogether undreamed of new method of unravelling the past most of its pages must remain forever sealed to hum in ken

And it is not the gray dawn of our history that is thus sunk in oblivion Some memorable treasures of the very near past seem forever lost to ur possession What would not the lover of music give t hear the strings of a Stradivarius respond once more t the magic touch of But science with all its accomplishments is impotent to restors the voir that is still

From the discouraging task of resuscitating the dead past we may with advantage turn our energies into the more frustful channel of preserving for future generations a competent record of the present And here modern science comes readily and abundantly to our aid Not that elaborate means are always required to fulfill the purpose Much can be done by very simple means. This in-difference of past generations to health this in-setcending. When we reduce how simple a matter it is lo renounting or near we recent now simple a market of \$30 keep a family chronicle, it seems absurd that it should regenerations hack Modern scientific intensity in the second to trace relationship, to say nothing of hereditary traits, a few generations back Modern scientific intensit in the laws of natural mheritance and in the suganic move based thereon should result in improvement in this matter But perhaps more effective than any atten matter But perhaps more effective than may to persuade people to give attention to these things is the direct assistance afforded by photography Until about one hundred years ago the possession of tolerably good family portraits was the privilege of the fairly well-to-do At the present day not only is the family photograph album within the reach of all, but even for the favored few who can afford to retain the services of an artist it is very much a question whether any but the great masters of portrait painting can equal the work of the camera in the hands of an expert And in no case does the artist s brush offer the same guarantee of faithful reproduction which is afforded by a first-class

More elaborate and refined means for preparing recorof today for future generations are given us in the phonograph and the moving picture. For obvious reasons these have been employed rather for recording events and performances of national importance than for the satis faction of the private individual, although they offer attractive opportunities in that direction also, and there seems to be presented here a promising field for future commercial exploitation

A matter which seems to deserve more thought than it commonly receives is the question of the permanency of the records laid down in our libraries. That paper m in a general way admirably adapted as a vehic historical records is fully attested by its universal use for many centuries Unfortunately it is a rather perish able substance liable to be destroyed by fire Another problem in this connection which somer or later must assume serious proportions grows out of the accumulation of printed records What will become of our libraries in a few hundred years' time, at the present rate of publication? Today this may be an academic question, but it is difficult to avoid the conclusion that some day, not perhaps so far removed serious thought will have to be given to the problem presented by our ever increasing library stacks

# Determining Direction and Velocity of Wind Currents by Signals from Balloons

GENERAL BOURGEOIS of the French army recently made a report to the Academy of Sciences concerning the services which the use of explosives may render to the science of meteorology by aiding in the determination of the direction and the speed of the wind, by means of the indication given by the sound pro-

Both in the artillery and in the branch of aviation it is very important to know what currents exist in upper portions of the atmosphere as well as their direction and their strength. This is determined in the daytime by means of sounding balloons, but the use of these must be foregone at night and in cloudy or foggy weather Heace the following method was devised A halloon is sent up containing torpedoes so arranged as to explode at regular intervals. Thus the balloon can still be heard and its whereabouts thus determined in spite of its having become mysuble. The explosions are registered by apparatus which enables the points in space, at which they take place, to be calculated Thus the trajectory is marked out by a series of points by what may be is marked out: oy a serves or points oy wase may be called a series of acoustic signboards just as it a marked by a series of optacal signals in the nosthod of sounding by means of theodelite By the totality of the horizontal projections of the bursting points and the knowledge of the time which has slapsed between the explosions, the speed and direction of the wind between the skittides at which two successive explosions take place can be readily

During the war the results obtained were entirely satisfactory both to artillerymen and to aviators. It will be desirable, therefore, to continue the employment of a method which permits the exploration of the move-ments which take place in the troposphere.

# Navel and Military

Meaning Towers for Birigibles.—The ship of the are must be preserved from sonatest with the ground just on equility to the ship of the son a prevented from touching believe. The many cases in which arraings have been wrighted when upon the ground proves that the only safe way to sachor on singular just no moor her hand on to a larly mooring must er tower file would then risk head-to-wind just as a ship rules head-to-sac when anchords.

One Leasest Breadmought —Our leasest draudnoughts ——"I war" and "Manasonhaste"—will make a great advance in size and power over any provinces warships and their insight will be 604 deep, these breadth 109 foces, and their mean draft will be 38 deep. The motive power will be similar to that of the "Mession," that as to say they will have the sleetine drave. The maximum speed will be 38 lands and they will have as crussing radius of 8 000 miles. Their displacements will reach the unpresendanted figure of di-500 toos. The argament will consist of 13 behas pure and 16 4-inch guana and 16 4-inch guana.

18-tend gain and 19-tende gain.

Find Oll Rooseway.—As showing the advantage of oil faul in merchant shaps, A. P. Allen of the flusping Board draws statution to the mercand carpenty resulting from the substitution of oil for each True, in a 15,000-tend indevelopt shap, this increase is 800 teles of eargo on a 7,000-main veryase, which at 850 ton means a energy of 840,000. Deducting from this the higher cost of the dil over each of 38,000, there is an advantage of \$87,000 even a cost-burning shap which is sufficient to pay for all the fuel used on over two and one-half vorrages.

Artillery Ammunition Returned from Franco-According to the Army and New Journal, the artillary ammunition received in the United States from France from the following of the arealston to March Sint natheauthe following 75 mm altragon, 2,558,000 rounds, 75 mm IR IS shell, 934,183 rounds, larger enhours, 512 rounds Fagures summaring these returns by formage are not yet available for recent mention by domage are not yet available for recent mention that the total returned during January ammunied to 60 446 short toos axeleding Franch replacement sized Of the total S1,177 toos were artillery and small carries ammunications.

The League Would Rule the Sea.—Commenting on the suggested assumpty for at least one navel power medicals in the League of Nations to possess a first equal to that of Great Britans, a writer in the League Three shows that with the League of Nations against her Great Britans could never preserve communications with her deminions. It took 50 Britals and Allied erments to round up a doesn German cruzers which had no hears to fall beak upon but in a var with the League course of fast wandlips based upon widely distributed and defended ports, could paralyze the overseas commerce of Great Britals and sterve the nizands into str

Army Ordanane Policy — Ihe plans of the Chair of Ordanane for the manufacture of ordanane material are based upon the probable requirements of exclanatation of guess and recuperators ? Smillton for the prodution of guess and recuperators will be manufacted to a capacity ample to meet future requirements but very small facilities will be maintained for the manufacture of gue earliages and gue forging, mass these out be obtained by regiol medifications of exacting commercial plants without any aerious closey. A body of skilled mm vill be maintained at the government areanals who in case of emergency can be distributed among semanancial plants.

The "Hedge" on Torquele Pretection.—Draing the war a forcetic segmention of invisions for the probasions of ships against the torquele, was the torquele space of sides against the torquele, was the torquele pretection being generally supposed from the skip head by means of bostons and then "The "beings" or "blines" which provid no suncessful on the monitors in reality as agglication of this jobs. Bejarstie placing, is was found, could not be abled in places, aggregately in heavy weather but in the "bliness" the placing in brought at a the top and hotten, and amonged with the circulary of the buil into one distinguish whole. Amongian of the circular of the buildines of the "bliness" they are part of the acquirement of the "bliness" test part of the circular of the buildines.

#### Science

Dr. Hessilton Rice of Boston who has ind many the line experiment in far-away lands starts this month on his suth journey of exploration in Bouth America He has built a \$4-6000 launch for navigating the shallow waters of the upper Amazon. The vaces which contains ilving quarters and a laboratory has a draught of only 30 melan.

Temperatures of Pavensents in Hot Weather The hot personant" which fairness in the typical description of city weather in the degedays deserves its bad reputation, according to an article by Mr. (\* h. Paton in the Bupassering Neur-Berowl reporting the results of thermometric readings made on August 6th and 7th at Riversida 20 miles from 6th Am to 10 V M at the surface of these types of pavensar also one foot and four fact above the personnent and over adjacent laws discussed to the personnent and the surface of these types of pavensar also one foot and four fact above the personnents and over adjacent laws discussed in the surface of the surface time of the surface in the surface of the

Studies of For-Silmal Machinery—In a pamphlet recently sensed by the Honorary Advasory Council for Scientific and Industrial Research in Canada Prof. Louis Sessimize and parameters research in Landau Y King of Mooffl University presents a preliminary report on the excitentely valuable investigations which he has been carrying as for some years in regard to the operation and efficiency of for-signal. The type of for-signal most fewered by the Canadian authorities in a fog-signal most fervess by the America nature as the modified form of spinpressed are stress known as the "displacest" Although a great many experiments have been made with apparetus of this character, actual measurements for the event at various distances from measurements of the sound at various distances from the sires and under various conditions had been lacking the sires and under varous conditions had been lanking until such measurements were made by Professor hing at Pather Pount, Combon, in 1913, with the and of a "phonomente", devined by Prof A G Webster of Chieft Interventy A harps amount of new information was thus obtained concerning the behavior of sound in relation to meteorological factors especially wind in relation to measuragest active superanty with an education of the well-known milest some which have been responsible for many marine disasters Professor King also devised a method of testing the "accusate efficiency" of the aren 1 e the actual proportion of power converted into sound. It was found that under normal conditions the output of sound was only about eight per cont of that which would be emitted from an ideal stem in which all the energy of the com-pressed air was utilised in the production of accounts After an interruption due to the war experi ments were resumed in 1917 Accustic surveys were carried out on a more elaborate scale in conjunction with meteorological observations including wind measurements at various altitudes made with pilot balloon arrensom as various attitudes made with pilot belicous A new inse of respects was also begun vas a stuct of the quality of the signals given out by the displace Prof Dayton C Millier, of the Case School of Applied Science, jound the party at Jather Pouri branguly us ham his inganasius "plessocials which makes a pht o-resplan record of segand waves and enables an assurate while the contract of the contrac analysis to be made of the purity of the sound analysis to be made of the purity of the cound of the relative propositions of accuste energy constant of the fundamental and the swartones. The descript made that the kigh erustones produced by the same do not travel for through the atmosphere, and therefore responsely a west of energy. Hence in designing areas the appearance of the state o the stipuspis should be made to concentrate all the energy, as far as possible, into the fundamental tens. Thanks to all these spaties, it will now be possible to place the construction of depositants and of survers as general, meledding these used on shipboard on a tenty scientific basis. It will also he possible to constructs portable appearator for use in testing for-quants.

## Automobile

Lubricans Testing Machine —A device has been constructed by an automobile amanufacturing firm in its own shop for testin, the properties of lubricants The machine is built on the following lines. The shade part is a pendulum hung is a bearing which is support it on a shaft rested by m and of a pully. I he bearing is compassed of tw. ir so a t. which pressure into be applied by a spring apring insuit if the produlum. The pressure regulation is official by a milled head series When the shaft is restated the fir tom between that and the branes causes the pendulum to at their accretion runting of degrees out of the vertex of an it is distant and the branes causes the pendulum to at their accretion that is the pressure on the jurnal jury an indication of the first ton. Fortice is refused by which the pressure on the jurnal jury an indication of the further from which the first ton first ten yellow you have for the first ton. Fortice which the first ton first ten yellow is the further and the pressure of the first ton first ten yellow 

Meaning of Piston Speed - lhe factor that limits the piston stroke and makes the speed of rotation so dependent upon the travel of the piston is piston speed Heretofore it has but it considered describle in it to exceed s speed of 1 000 feet per minute which has been de med to make for greatest off came, combined with andurance by many auth rities on design and construc tion of internal combusts is in store During the past fow yours there have been instances of engines that were giving satisfactory service with pistun speeds of 1 200 to 1500 feet per minute and in some automobile and aviation engines the piston speed may attain values of 3 000 feet per minute without power losses due to undue mercare of internal fri tion I ubrication is now the main factor that determines piston speed and the higher the rate of person travel the greater the care that must he taken to ins me proper ciling

Valve Operating System Depreciation -The only remedy for wear at the various hinges and bearing pins is to bore the holes out slightly larger and to fit new hardened steel pins of larger diameter. Depreciation between the valve plunger guide and the valve plunger is usually remedied by fitting new plunger guides in place of the worn ones. If there is sufficient stock in the plunger guide casting as is always the case when these sembers are not separable from the cylinder casting, the guide may be bored out and bushed with a light bronse bushing A common cause of irregular engine operation is due to a sticking valve. This may be due to a best valve stem a weak or broken valve spring or an accumulation of burnt or gummed oil between the valve stem and the valve stem guide. In order to prevent this the valve stem must be smoothed with fine emery cloth and no burn or shoulders allowed to remain on it and the stem must also be straight and at right angles to the valve head If the spring is weak it may be strengthened in some cases by stretching it out so that a larger space will exist between the coils. Obviously if a spring is broken the only remedy is replacement of the defective

Optimistic Trade Reports - I he success that has attended every automobile show held in the country has greated great optimism in the automobile trade The ban placed on production by the government pro vented any accumulation of cars and because of the scarcity of automobiles the increasing demand even though many prospective car owners and drivers are still in the service is so large that no difficulty is experi enced in selling automobiles During the war the men handling motor cars had a hard time as there was a shortage of expert labor that made giving adequate service out of the question Many people who buy new cars annually retained their shi machines last year and as a consequence are in the market this season. The accessory business is also showing ugns of improvement This is especially tru of the tire trade as the past open winter kept many cars in use in the Northern and I astern States that would ordinarily have been stored for the severe winter weather so a much larger number of tires wore out than would have been the case under normal conditions There seems to be no immediate prospect of a drop in prices as the present supply of cars and their components will not keep up with the demand. The opinion of those familiar with the trade is that there will be considerable revision of prices when the care f : th 1920 season are offered and considerably mere compethon than now exuts will be noted at that tim

# The Carrier of Malaria

# Museum Models Which Reveal the Structure of Anopheles Maculipennis

THI malarus mosquito though no new problem institutes an ever recurring the Evity summing heat they post with us and every in mir we are obliged. to wage all over up a the war upon lam. Thus year the suit; it is erves und is no fact receiving more than the usual atsoldiers in the comps we are confronted with a series of artificial and highly o centrated seats of possible infection which the conditions f living while w het to the closest ontrol are very far from those of ordinary civilized existence and therefore likely to lead to all sorts f and therefore likely to lead to all sorts. I sanitary troubles despite that control. It the same time we are putting forward a project to grant moccopied lands to our returned soldiers which involves consider shie danger. Such land as is available for this purpose is of necessity land which has not heretofore paid the cost of reclams tion. This necessarily means that it is land on or about which there is an unduc-

ising on or about which there is an undu-preponderance of water. In result nt of Florida or the Mississippi Valley may be sufficiently acclimated to survive the conditions which surround him the man from New Ingland or the Northwest suddenly and without preparation set down it these conditions must includely

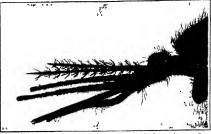
The scourge of malarm is as old as history itself As early as the fourth century
B ( there are indications which are now accepted as authentic of malaria epidemies the disease is consided to have been a potent cause if not the dominating cause in the decline of the Grick evaluation. The ancients could not combat this up. neen for because they were ignorant of its nature. As the name indicates they imagined that the attack cum from the air—preferably from the night air which their fancy endowed with all sorts of evil qualities It was not until 1897 through the discoveries of Ross and others that the life history of the malaria parasite became known, and of course even now the old ideas prevail in many uninformed quarters With our present fand of knowledge, intelligent defense against malaris is feasible and this year of all years, when so much is dependent upon the health and working efficiency of the nation, the subject is being given particular

Malaria is transmitted by certain me bers of the mosquito family Since this discovery was made mosquitoes in general

some 40 different spe-United States alone

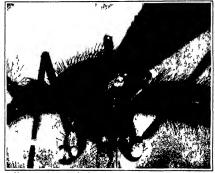
They range as far north as the Arctic Circle, and in Maska Greenland and on the tundras of Siberia, where other meet life is scarce, they constitute a terrible scourge Explorers tell tales of the mosquitoes on the snows of the har North which make the misded ds of the Jersey variety seem tame и сотралион

Mosquitoes in general are good travelers, though pos-sessing little power of self-locomotion or even of self-direction. Like the old style balloons, they go when and where the wind listeth, and, with a mild and favor able brocse, they will migrate to 35 or 40 miles distance from their breeding places They vary in size from one-sixteenth inch to the huge Jersey "Gallinippers ' of half



Head structure of the female meaquite, which does all the damage in connection with malaria propagation

While any old kind of mosquit is a nuisance to have about the place it is fortunate that they are not all pathogene. In fact, of the 40 American varieties the



Museum model showing head detail of male or suck blood

that overy was made in nonjunous in a naria have reserved a good drait more attention than before, and new species are constantly being found. Although the meet in question is a tropical one it is by no means confined to the tropics, and the special one is to by no means confined to the tropics.

one 40 different spicers having been although the meet in one of the provided wing measuring been although the meeting of the provided wing measuring the right provided in the position of the provided wing measurement.

Mosquito does not bite, his bill

scussion will therefore be confined to

Mr. Mosquite does not bite, his bill is so blust that he could not be a blood-sucker if he wished It is Mrs. Mosquite who does all the deadly work of fever propagation. She is meet active around dawn and after enuner. She avoids strong light and prefers dark colors she is cascattailly a domestic creature, staying around. Busses by preference. In the example of the control of the colors of the control of the colors of the colors of the colors. The colors of the dark corners of cellar and garret, and on the first warm day of spring are out laying their eggs. Save when extended by the arrival of this hibornating period, the life of the female is one or two months, the main, on the other hand, lives but a few days. The food of the mosquito is the juste and nectar of plants, and of course juste and nectar of plants, and of course map, animals, reptiles, and even cater-pllars are butten with the same freedom.

The female mosquito lays from 50 to 100 eggs at a time, on any quiet bit of water In about three days they hatch, and though at first the laws is very small it grows rapidly and attains full development in a

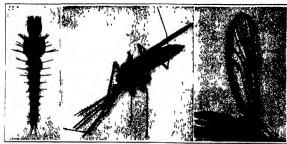
few days We have then the familiar wrigglers of the old-time rain-barrel and

the uncovered castern In this stage the larva must have air, which it breathes through a siphon tube located near its tail. The normal position of the little animal is just below the surface of the little animal is just below the surface with tail pointing upward I is as this time that the presence of an oil film over the water of absitation is fatal to the young mosquito, the oil clogs the siphon and the larva suffocates This is by all odds the simplest and most effective way of destroying mosquitors I is a simple because the problem of locating the pasts is an elementary one. It is effective for the an elementary one, it is effective for the same reason that prolonged immersion in water is an effective way of destroying a

During the larval stage, which lasts from seven to 14 days, the malarial variety can be distinguished from all others, by can be distinguished from all others, by the curiously inclined, by virtue of the fact that it lies with its body parallel to the surface of the water, while the other species hang with their heads downward. When hang with their beads downward. When the larva is ready to graduate, a T-shaped crack appears in the skin of the heads, from which the pups energes The pups rumans in the water, but does not eat the pups abel. As is the case with so many other meeting in the adult mosquito. The most critical moment in the the life of the mosquito is when it emerges from the pups shell. As is the case with so many other meeting the pups abel. As is the case with so many other meeting the pups are not hard or dry enough to the pups are not hard or dry enough to

fly at once, and the creature is easily upset and drowned In this way the flow of tide-water into marshes where

water into marshes where mosquitoes have bred kills great numbers of them great numbers of them to the same the same to be recognised three major parts. The head, the thorax to which are algorithms and the same to the same thousand simple eyes or facets. This enables the mosquito to see in all direc-tions. In front of the jaws tions in front of the jaws are two branch-like growths with 15 or 16 joints, and at each joint a whorl of fine hairs. These are the antennee, or organs of heat Beneath as the proboacis tool-hox First comes



Models of the malarial mosquito, showing a view of the larva from above, the adult female, and a detail of the wing

labrums, the mescutto's drill, a long implement with a greove on the usiger side through which the blood of its pays is sucked. Next comes the hypopharyar, a thin blade which can be closely applied to the under side of ske labrum to forgue a closed channel for the passage of the sucked blood. The hypopharyar has a fine tubular channel of the own leasties, and it as through this that the makanis sposes enter the body of the hone. At the two called and body the labrum are two pairs of sineder isnecillar instruments with spear-boad points. These also enter the wond and help to brace the mosquitor is nead what its owner is enjoying his meat. It is the the third which it owner is enjoying his meat. It has been the form of the control of the various organs and protect them while not in On either side of the probosus are the maxillary

use On either side of the probosus are the maxillary papers or organs of touch. The body is composed of three rings, the middle one bearing the wings. The latter are so very thin and delicate that they practically reliuse to make any impression on the photographic plate, gave where they are reinforced by ribs covered with fine scales. The arrangement of these ribs varaes with the species, in the makinal variety there are four black spots on each wing which give rise to the name machingman already which give rise to the name machingman already.

The legs are hollow tubes with the muscles inside They are connected with the body by the coxel or hip-joint This joint al-

lows great flexibility of movement, and is altogether a very creditable but of encreditable bit of en-gineering design. The mosquito has three pairs of legs, of seven joints each. The hindermost pair is not employed in walking, as may be readily observed, but acts to balance the insect in flight and as an organ of touch The mosquito has two pumps with which his ex-tracts your blood, and when they both get under way you are relieved of a large drop of blood and moculated with a goodly colony of malarial spores in less than a minute In view of the great timeliness of

great threliness of an discussion re-garding the malarial measurito and ways of meeting its ravages, the American Museum of Natural History has installed an exhibit consisting of large models of male and female mesulipennis, together with the viruous stages in the development of the soult insect. It is from the models that the photographs shown herewith are taken

# Microscopic Organisms in Drinking Water

A RECENT experience of the water company that supplies the villages of North Tarrytown, Hastings, Debbs Ferry, and Roardalo near New York, brings to mind the manite disturbers of the peace and well-being of the sommunity, that may lurk in water apparently pure and underfiled

of the community, that may lurk in water apparently pure and underfiled
During the past few months, the water furnished the consumers by this company had a very diagreeable taste and oder, particularly marked during October Compilates came to the company per constantly, that Group the Law Person of the Compilate came to the company per constantly, that from the tap was first duantied and the mercescope due to show the presence of any organism that would account for the peculiarly unpleasant taste and amount of the peculiarly unpleasant taste and amount of the peculiarly unpleasant taste and amount as the constant of the peculiarly unpleasant taste and amount as the control of the transport of the control of the superfection that the past function of this superfection that the came of department of the came of the principal of the came of the control of the came of the control of the came of th



Synura in drinking water, magnified 1600 diameters

the reservoir to the fliter plant broke up this loose colonial organization, so that the tiny particles escaping into the flow of the faucet though still malodorous and

less to man, was put into the reservoir, and in a few days both odor and taste had entirely disappeared

This recent experience with the water supply well il-lustrates the fact that besides the larger forms of plant and animal life with which we are familiar the learest water may be teening with minute microscopi fries invisible to the unaided eye. These may be becteria arysing to the unanted upon the sum is a conternal accuracy in man deadly donase, or some now not in which has harmful form or patchance some feautful and perfectly harmless plant or animal. The balan c and relation of these forms are of vital import me. (c) public water supplies for if there is a disturbed equilibrium so that any one of these organisms is reases unduly in numbers one of success organisms it reasons that it is until in numbers the water may become us sightly ill simbling and bad tasting. The flavor imparted by each fit these various tray organisms found in water is very characteristic like Symura found in the larrytown at 1 Dobbs Ferry water supply imparts a distinct cucumber like taste another the Asterionella gives a string fishy flavor, Aplantzomenon causes a grassy tuste. Uroglena imparts the unpulatable flavor of col liver oil. Constant war fare upon these tiny troublesome focs which insist upon taking up their habitation in our drinking water is the price of safety —John J Schoonoven

Receiving Wireless Messages on a Paper Ribbon PHOTOGRAPHIC receiving and recording of wireless messages as a matter of regular daily routine bas been carried on by Naval engineers for some time past, at the Otter Cliffs

nest Bar Harbor pose the engineers have made use of vented by ( A Home an el etrical ngmeer of Schon-ctudy N Y This i die invention perto supplement or icplace the ear in r ading wireless tally deaf man r ceiving operator
ii a station so
equipped
The photographic

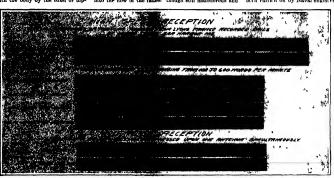
it order which is companying illustrati n makes for greater speed in rereiving greater accuracy in decipher-

mg and provides a permanent rec rd of every dot and dash in every message so received Because of the very 1 is its tuning that can be obtained and the resultant high degree of selectivity it has been found practicable to receive messages despite many inductive noises and interfering signals which ordinarily have rendered respition impossible Although the instrument is not immune from the offects of static strays it has successfully recorded messages at high speed regardless of strong state interferences that without its aid would have baffled the receiving operator it has successfully recorded messages

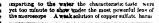
It is stated that messages have been deciphered with its assistance when operators were unable to get a single word of it by ear alone. I rem now on receivers do not hear by their ears alone. The photographic recorder supplements the usual method of receiving and in that manner the outstanding obstacles to accuracy in wireless receiving have been eliminated except for severe static interference

The photographic receiver with its permanent record is a guard against error and will actile any dispute, for its visual record of a message in dots and dashes distinctly shows to the eye what was received. A photographic print of this type is of unquestionable

As to speed in receiving this machine has frequently recorded at the rate of 400 wor is per minute and more recently in a test conducted by Mr. Hoxic himself the machine recorded a low power message at 600 words per minut. Up to this time the most rapid method of recording radio signals has been I v the phonograph but this must still be transcribed by car and not by the eye Moreover no permanent visual record is made.
The phonographic method has never vet approached the rate of 600 words per minute, so the new instrument has hung up a new speed record so to speak An int i sting (Continued on page 628)



Wireless recorder tase with signals made under different conditions and at speeds from 50 to 600 words per minute





stly tried out by the United States Navy

# With Trees for Ears

## A Wireless Station Within the Reach of Everybody

WIFI a pair of receivers to his saw an analysed yester to a certain radio station heard a high toned hims which changed to a low growt that the sked to the upper reaches of the musical scale in a faint vir faint bins and from timers spit incomputate had had his song made southils. In operator rapidly utering the knots on he capter and conders are, need to let as site style through the changing radio signals which were the retrieved for attention together in the receivers can cleave the reservant of the view of the receivers of the receive

of the Dutri t of Columbia and the eignule were received

or san Dustri t or committe as of the eigenise were received through an oak trees for an universe. If m not a joke nor a sensitive currenty the strange descovery of the George () Square Chief byral Officer that trees—all tree o of all kinds and all heights growing that trees all tree of all tanks and all hughts growing anywhere, were making a own works to review and an tennas opinhined. The making first tank to his attention in 1934, through the use of trees as grounds for Army busses and telegraph and talkingne sets which meanity they ground and in a day assoon functioned poorly or not at all with ordinary grounds. Bight then be biggar egy remonits with a way to nearney what possibilities, if a vy, the tree had as an arrail. But in 1904 registering hyper was fat more under violent than at present, and vacuum amplifying tubes were not thought of

During the war the 'signal Corps established a chain of spend a neuving stations in different localities to copy and raised but comp and allied rides messages. Some of thus statutus were instructed to text the efficiency of

or from as receiving antem ac growing tross as rectiving antitin as. With the rounarchale searchts amplifiers 1 on available, it was not only possible to recent signals from all the pranciple I utopean statemen literagh a free but it has developed, beyond a theory at 1 to a fact that a tree as a good a say man-mand armain parties of the size or extent of the fact for receiving and better in the respect that it brings to the open entors can fire its asstate.

response, mass it ormings to the up review area in it is submissioners.

Thus are invoid statement, yet this to be cond the condition of the Nation stands a lettle portable house, the oak teer, a small reconvey, et and a couple of exhaust mass and as officer on duty, and the cursous may such permanent, hear for thanked we that the agendals or received are neither faint nor interrupted but strong influenced dots and dashes even when they come from far-off Nauen. Page after page is copied dealy from the propagands make rail which Naum sentes out by the ream Loyeas, Poiding, ships at wa even if the NC-office on her way, are likedy flagle, and the histories of hot in the phones typing on the table. It will pussed the same to the condition of the phone typing on the table. It will pussed the same to the same couple to try to 'take their otherwise than with the phones typing on the table.

It will pussed the amendour as it has pussed the separate the same than the containing the containing the containing the containing the containing the same shall be a sense of the proper of the containing the containing the same shall be a sense of the phones typing on the table.

an mealated aerual I be method of getting the disturi-ances as potential from tree top to merkument us so mapple as to be almost laughable. One elimba a tree to two-thirds of its begith, draws a mail a couple of sin hes mote that the property of the single at the couple were to the recovering apparatus as if it were a regular landon from a folly copper or alturatus passent from presently some of the couple of the couple of the couple the dop to ground through the tree are during the couple of the time top and the other couples of the couple of the couple of the top to the couple of the couple of the couple of the couple of the top the couple of the couple of the couple of the couple of the top the couple of the couple of the couple of the couple of the top the couple of the top the couple of the couple

It is interesting to learn that the tree behaves very it is interesting to learn take ran free on severy ways much hize any other sarral, it recovers better in dry clear washer than in muggy, damp weather it plucks meanages fro in the other more clearly at night than in the day. It is affected very little by rain. It is effected not at all by the presence of other trees, so far as has yet been accordanted is makes little difference whether now as an objective of a make it it difference whether the delewate and lin a tree in the forest or a lone tree on the plant. Gertamly if makes no difference that assumes to surphila; whether the tree by tar an ordinary tree er a giant, it was a 6t-foot oak over what he very sweetful what good people the Germans really are. And to prove that it made no particular difference what it mad of a tree was used the officer in charge switched to a price that the contract of the con

determined that two-thirds of the distance from ground to top is the best place—in a 50-foot true 40 feet from

One nail is sufficient, and it may be any kind of a nai the small as withit tend, and it must be may kind of a small but copper as preferred as not return, in practices, if a tree statem as to be at all premarest actual backwards when and connected it be some wire, such additional small up to also or eight smalling the discretional contents a little stronger But 40 mais apparently product no clearer as grants than half a down. The first pure across as a reconstruction of the content as the co

The tier may serve as a receiving staticit for several sets either connected in series with the same material

sets either rosmested in arrass with the square inaternal or from a paratic terminal.

Some skept it reminals to the first state of the same shall be seen and the same that the war leading to the nad in the tree and the same that it is seen as the same that the same is the same that the same that the same is though as every just as soon as the connection as again established.

lust what the tree will do as transmitting station just what the tree will do as transmitting station for radio tiegraphic messages he is it is in determined in the signal Corps by permanental? I intory. As those me charge express it the fast hand I of monettered that the matter in still in laboratory stage only. What remains to be done now set of evel; I it been not hoods of using the dimensional contract of Last.

But it has already how about it is the way can be

using the diministrated list.

But it has already been shown if it the trie can be used in wireless telephony and fill it distances it has been shown that two-way taked it communication is

used in hours and refers a vidip! I is columnuste atom as cases and seal based through three will remarkable low values of transmitting antennas it? If a free man be used to seem of wartle set kephonic waves it seem not unuscaonable t suppose that it will do no not easily with the bale graph; waves. Wy present the Bignal Corps is at work on it; institute to test the possibilities of the tree as a transmit in, skillow to test the possibilities of the tree as a transmit in, skillow to test the ball of the seem of the tree as a transmit in, skillow to test the ball of the seem of the tree as a transmit in, skillow the properties of the latter of the tree as a transmit in, skillow the properties of the latter of the tree and the seem of the tree and the tree accurating affecting it is not that it was that it was a least, the tree iccurring affecting it is not private possible of the private private possible of the private possible of the private priva at least, the tree occurring station of 18 up great possi-

bultius
I run onough there are few trees whi is remain intact
under shell fire and doubtless will this possibility
under shell fire and doubtless will this possibility
under shell fire and doubtless will this possibility
action: consider all trees as den, i use on my serial
stations. But there will also whele it is belief under the mes
and not all actions will be fought if it is ground. What
would it have meant to the local if titlen it have heard
that every effort was burg made to find and relieve, it
or by which it might have sent I have segres supple
mentions that there days have been to be meaning that the processor and the supplementars that the residual the series of the series when the meaning that the residual the series and the series and the series that the meaning that the residual the series and the series and the series and the series are series as the series and the series are series as the series are series and series are series as the series menting that carried by the pigeon

The greatest development how vi of the tice as the foundation for a recoving and | sails a sending station will come in peace uses (carral Figure has

'In view of what has been as omply telegraphy it is difficult to probe the what extent this means of communication may be ultimately developed If, as indicated in these experiments the earth's surface is already generously provided with efficient antennae which we have but to utilize for soil communication ted well upon m connection with the future development of the transmission of intelligence

Since a transmitting station : control point for electromagnetic waves sent out in il deretions over the surface of the earth, a large class of information, such surface of the earth, a large class of unformation, such as meteorological reports, tryor riports and general mass at mas of interest to all mass is time to sent from central points, to be received at many place within the radius of influence of the signal at time and thus, too, by the simplest forms of apparatius questionabily take an intens. Interest in the tree radius work Al present, while the government has lifted the bas upon assured that the government has lifted the bas upon assured that the contraction of the structure analysis. It has not removed the structures against

The senal malways the great problem for the amateur Lack of both money and material prevents him eresting anything very large or of very great capacity. If any lad with a recovering set and some thermionic tubes one book to a tree and take in any wave length he can tun to, will not tree radio vanity increase the devotes of

this particular variety of indoor oport? The matter is one of some importance, mammels as many valuable recruits to the radio world have come from annature ranks, and many radio engages got has first state for the fascenating art through a home-made training soil and detector, under the active the aircrease of the product of the safe has the contract of the safe

I xplorers, discoverers, engineers in far places, the fores service the woodsman, all have use for the new develop service the woodsman, an area use for the first unusual possibilities for the investigation of strongheno electroity phenomena and for what may be salled the physics of botany (or the botany of physics) and perhaps as the road by which the unsolved pussle of growth may be the conduction.

Meanwhile, it m a thought not without great power i Means hits, it is a thought not without great power to move the sometive imagnation that every tees, growing cvarywhere is a wireless tower and antenna and that, as General Squier save, "it is significant that a twa, possessing utility and natural strongth, architectural beauty of design and endurance for superior to artificial structures prepared by man, should be able yet further to numeter to his needs."

## The Current Suppleme

The Current Supplement

Off of the great problems of our lumber merchants in the sheap and moderately speed in transportation of the sheap and moderately speed in transportation of the the sheap and moderately speed in transportation of the the sheap and moderately speed in transportation of the the sheap and moderately speed in the sheap and to the sheap and the

## Demobilizing Shells

Demochilizing Sholls

If the full perturbars of the amount of shells existent
in the various warring nations shell plants and shell
dumps were available, the total teamage would rea,
doubtless, to namen figures. Except for such steels
as are normally mantaned by the various military
provers, restry the wholes of this west total counters of
national that can have no immediate use, each, if one
hopes are realised will have no our foot gaste democratic
as sized they afford a vest mappy of ray material for the
norting numes and the steel of the opport driving based sections,
from the shells of the copper driving based which, of
tourse, have high values, and of the explosures with which
he shells are filled. After this has been done, the shells
are loaded into railway trucks, taken to the steel works
and there, as in the case of the plant which is fillentessed
on the cover of this issue, they are unknowled and dustged
on the source in the case of the opinion with the
are loaded into railway trucks, taken to the steal works
and there, as in the case of the graph with the fillentessed
on the cover of this issue, they are unknowled and dustged
on the cover of this issue, they are unknowled and dustged
on the cover of this laws, they are unknowled in the second
on the third of the supplemental of the supplemental of a large and the same. Our
drawing is hand upon one as Theoriestal London Hoos,
representing a large shell change being formed in the semple yard of a German shell plant.

# Invention as the Foundation of the Nation's Wealth

## Exhibition of the Interior Department Which Emphasizes This Side of the Work of the Patent Office

By C. H. Claudy, Washington Correspondent of the Scientific American

THE Interior Department has jest hald a most estudent of the most entire of the product of the great of the g

product coke oven and the X ray I rance as halled as the home of photography, the Jaquard loom artificial perfigeratic, and parts of the divelopment of the open hearth process and of alumnum Italy of course as credated with varieties and Norway with half of the north

sredited with studies and Norway at the half of the work measure you develop the fination of strongs.

Then comes the American hat starting with the cotton and the control of the starting of the starting with the cotton and the major telegraphy unbanned subsert the sewing machine the airbrake, the stiephone the anadessend light half the work of alumnum the multi sum motor the airplane the insetsonepe (foundation of the moving patture midsarty), the lincology the steamboost electric walding high-speed stead, half the labor m connection with the fixation of strongen the typewriter the phrangraph, the trulley case, and the Cottrell precipitation mocess.

Amendment table lates the 'ton greatest myentions of the last quarter century as determined in the Releviers (France and America), the steam tribuse (Britania Ramanday contact). There are the electric furnace (France and America), the steam turbine (Britania) that autienchibis (France and Armano), the moving picture (America), the airplane (America) wireless (idaly) the organice process (Britania) the induction motor (America) the landrype (turnera) and electric weaking (America) by which it a seen that the country gate credit for most the sent of the world and the country gate credit for most the sent of the world.

A third table lints the 10 in vinded in wincitions as determined by the American Country (Institute of Patinia Mr. Clas from estimates model of the country of th

determined by the Assistant C immuseoser of Patants Mr Clay from estimates made to the various examiner. These are the steam engine printing the aware machine the telegraph, the gas angior the phonography varieties the simplane, the kinetoscope and photography and one-half of these saw pare Anne rans in origin. To date so the salabition shows we have saused over a milision and a quarter petrets. Morn of these bave here assisted in the part of the salabition and a quarter that are not improvements, adaptations. It amount all are on improvements, adaptations.

very very few are what are known as basic or pionpatents for malance had there been patents at the time Gutenberg lived any he to sk out on the making and use of movable type would have I a pioneer patents But the type-setting machine patents are none of them truly basic since they are all on the ad pistion of known methanical movements to produce something which as already known and otherwise produce! But Marcon when he took out his patent on July 13th 1807 obtained when he took our has patter on July 1778 10-97 ontained a promoter patent since at was the foundati n of what has muce be one a great industry and an integral part of the fabros of civilisation.

In the patent office exhibit were shown by pioneer patents. One takes off ones hat to the diplomany of this patent office officials for the way they have dudged the patent office officials for the way they have dudged.

the pattat office officials for the way they have designed one of two burning questions as to who as a 121 yr sepons ble for some of the grast lave atoms of history. For metaner. Wright is represented by his pattat of March 22d 1905 for a fiving machine. Untries by his patent of tetelose 24th 1915 on the hydrogia and Mont-gomery by his pattat of September 18th 1906 for an acceptance.

Philips is credited with a one man power submarine (1852) Tuck with a submarine placing torped (1884), Lake with a submarine (1896) and Holland with a sublake suth a submanne (1800) and Holland with a sub-mann (1902). Other pioner patints rish ired were those of de Forrest which resulted in the amphibir that modern wirst of electricity which makes easy so many otherwise impossible thouge life long datance wireless and tripphone. It finance current recibir 2 dones in an an-dessent lump specking machine speaking telegraph and tripphone. Berliner mi replace and graniphones, Rallu relighment than the submaniter was designed and valve in an artist. Bell the telephone discovered and walve in an artist. Bell the telephone discovered and produce the submaniter of the submaniter of the submaniter of maniter was a submanite of the submaniter of the submaniter of machine the submaniter of the submaniter of the submaniter of the macutary vapor lamp. Hines, the first reary patents which also we the cutter have and known (1884). Van (Castanes) maps 2409. (f mittued in page 840)

## Correspondence

The editors are not responsible for statements made in the correspondence column Anonymous commu as cannot be considered but the sames of cor-dents will be withheld when so desired

## Puffed-Brick Ships

To the Editor of the Entertro America and dappoint in two with a great deal of surpress and disappointment that we read in the Scientiffer America and disappointment that we read in the Scientiffer America of a recent issue an article describing two puffed-brick ships which are 'soon to be humeled at San Francisco. For the information of yourself permit us to point out that these ships are being constructed not in San Francisco but in Oakland, at a point about aims falled statistifform the former city constructed not in San Scientiffer and the control of the Convenient of the Convenient of the Convenient of the Convenient of application and the expenditure of a large amount of asspiration and the expenditure of a large amount of asspiration and the expenditure of a large amount of asspiration and the expenditure of a large amount of asspiration and the expenditure of a large amount of asspiration and the expenditure of a large amount of asspiration and the expenditure of a large amount of asspiration and the expenditure of a large amount of asspiration and the expenditure of a large amount of asspiration and the expenditure of a large amount of asspiration and the expenditure of a large amount of asspiration and the expenditure of a large amount of asspiration and the expenditure of a large amount of a spiration and the expenditure of a large amount of a spiration and a large amount of a large amoun

RUGANE BOWLES,
Recreatery, Oakland Chamber of Commerce
Oakland, Cal

## **Future Aircraft**

Future Alveraft

To the Editor of the Scrawvivro Assistance 
Reading Mr. of Orey's interesting action, "Alvelop

Ventus Alepiane" in Science 2002 action, "Alvelop

Ventus Alepiane" in Science 2002 action, "Alvelop

Line 1971, as a largemen on the subject, In tempted to

drives argued of the Schooleane, Simulation and Science 1982 actions, and the second of the samples and vice venus, would it be

to complete to assistant that a happy solution for the

computation of the tempted of the second of the se

outer skin sontaining balters within the walls. Wouldn't this give to the simplane such buryancy that it could practically however or sarry mon't ingit and passangers' But one may object on the ground that a fuselage praced to earry than much surtaining gas would at one become disproportionate or much larger than the conventional size of finalege. In In J Inarily thank so size the inner part of finalege as they now are built is not taken of the most part for any purpose whatsoever Further other means of sustention ould be supplemented by providing vertical air-servers or holis opters but the first providing vertical air-servers or holis opters.

Brewton Ala

## The Langley-Manley Engine

To the Editor of the SCIENTIFIC AMBRICAN To the Editor of the SCHENTIFIC AREBICAN
In a letter appearing an your nesse of November 90th
Mr Edwood Hayans objects to a comparison of the
Langley Manky engine of 1901 with modern aurorati
engines claiming that "The power used was steam
and therefore hunted in its caduring capacity to a few

While it is quite true that I angley did build so

while it is quite true that I angley did build some remarkable stoam modors nevertheless the particular motor referred to was not operated by steam but was of the internal combistion type II emboded such advanced sugmenting that it is propored; considered advanced sugmenting that it recovers significant to the supplier of the automobilis radiantity as Mr Hayawa should not have been sware of its sources. Many of the prendped features have some passenger of the supplier of the subdiversament.

Mr Haynes is also very mu h mistaken in his estimate of the enduring capacity of the steam engine. He has probably forgeticul for the moment that the real work of the world is boing done by the steam engine, and that there are in operation today steam plants fitted with condenses and with improved engines and ginerators, that empar is orably in fact and water economy and excell in the matter of total accipit and shirty the very best sintered embustion cagons. In comparing the steam plant with the Rocket he sp it lably realling how, in the cally days some steam in cluts has roared past condensers and with improved engines and generator him only to st p a few makes further along to repl

mm my raw in a two mass convenient stream.

The possibilities of the modern exam power plant cannot be judged by the semi-experimental outfits of a decade ag. Tor it must be runchered that the same advances in all branches of engineering that have made the modern automol is possible are also available for the development of the steam plant

Columbus Ohio

## Quinos

To the Editor of the SCHNTIFE AMERICAN I read in your same November 23d page 415 in a paper on Substitute Bread

paper on. Substitute Braaf.

The Asteen lad a plant the Quinos, which took the
place of wheat. It is a grass and has tray mustardlikes
seeds. Owing to the ravages of the Aphies it has entirely
desappeared. But it made good bread and cakes.

Quesses or Quesses an antivi. I P-ru and grows on the
lagh alopus of the Andréa a region which we call serve
Bedongs to the family Champodiances. Chempodeses
Quesses. Wald.

Quinos was cultivated by the Indians before the dis-Quinos was cultivated to its initiates offer the case-overy of America and it is actually largely cultivated for the sake of its a eds which are a regular food on the siers, and occasionally on the coast region ( cota') Quines as boiled like roce and mixed with potatoes and some condiments or rosteed and ground and atts in this

Bo far as I know Quanos has never been used for flour or bread Feru imports from Australia and other countries most of the wheat used on the coast region, and at would be a great thing for our country if Quinos could be made into bread

Chicleyo, Peru, S A.

## For the Motor Tourist

## What an Adequate System of Road and City Signboards Can Do for His Guidance

By Avis Gordon Vestal

N an earlier issue of the SCIENTIFIC AMINI IN the Editors have permitted me to retail the results of my observations regarding the adequate blazing of the motor highway The suggesti is with I made there and the prin iples which I laid down had to do with but one aspect of the case. The tourst wants to know what road he is on and he wants assurance that he will be able to stay on it till he reaches his destination but he wants a good many things boudes that Some of these wants are more important than others but I think if you will bear with me while I catalogue them

you will agree with me that they are all worth meeting in the first place let me suggest that it is a wee bit egotists al fer a town and especially a small one to take exotistical for a town and operally a small one to take
the granted that all when riche throw when they are
that was all very well in the data when hay motors
that was all very well in the data when hay motors
that one of the commence of road transportation and
the state of the transport of the transport of the transport
together of the neighbors. But now the
proded tournag are tale as per ple hundreds
and thousands of miles fr m hun. The
say and the outsiders of the village Slow

The down to umpty-ump miles per hour shows that the inhabitants know the gas shows that the innaniants know the gas buggy is abroad in the land. Why not add the name of the town with perhaps a word of greeting as Wel can to Hamil-ton? I have driven through countless towns where the name was not to be found even over the post office! Of course one might sometimes make deluctions from the signs over stores but if these were always to be relied upon there would be a good many more Bostons and Armes scattered over the countryside than the map indicates. In my observation the cities along the lincoln llighway are particularly careful to introduce themselves to the stranger at their gates.

selves to the stranger at their gites
It would not cet much to add a few
pertinent facts of interest about the
method of the stranger and the stranger and
method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and method in the stranger and

interest exist these may well given for Inding them I he address of the local Automobile the Or Cambre of Commerce would be of in terest to many strangers. The Detroit Auto Club by posting a brief statement of local rules has given concerte evidence of its realization that the traffic laws are not universally the same and the contraction of the contract not universally the same but of course this would never do in the communitieshappily growing less in num-ber as well as in weight— which rely for ready cash upon the unconscious violator of some freak ordinance

Signs promoting safety are more needful than numerous Warnings of grade crossings warnings of grade trossings are probably in the lead yet are not at full efficiency Other significant signs tell of sharp curves of bridges out of roads torn up for repairs More often than not no warning is given of



An interesting method adapted by a Kaneas community of bringing out the historic interest of the Santa Fe Trail

these temporary or permanent betructions, and when succes (comporary or permanent netructions, and when notice does appear it is seddion supplemented by full details. Berkshire County, Muss takes a medal here It gives a diagram of dangerous curves and corners large enough to be read on the fily and it is scrupilous indeed in posting full directions for detours around road.

How to get into towns and out again, and some details as to the ultimate destin-ation of the roads, are set forth on these simboards

construction work. The mountain roads up Thompson Canyon in Colorado and through the Yellowskinne are also well posted for dangerous 1 rms while on a road lacking to Dervera mountain parks we find mirrors set on the outside of blind turns

Places of historic importance are worthy of memorialis-ing when in sight from the road or casely accessible by

information about local traffic rules, spots of historic association, or danger points along the rotte is always welcomed by the motorist

side trips. At Pawase Roid Kansas, the motorist on the Santa Fe is told about th ota, there is a details of in Wyoming At New Frank lin, Mo, we found a centra t monument depresting eginning of the l trade route which was origin of the Sante Fe many miles about New York this feature of the tourist a pleasure has been will attended to perhaps Tarrytown is as completones an
example as any, with its old
churches and its Elsepy
Hollow and its Headless Horseman Shrides

Special boards with more detailed information abthe route than the painted poles can convey should be more numerous. These should carry the name of the

the route than the painted powe can sonavy more unmercure. These should early the assume of the road its termini, a replice of the poil symbols, milaser to the several large towns of the state, and a statement of any points of special interest. The tourist of the state of the s

The crossing of state lines and con-tinental divides is always of interest, sometimes such points are well marked, sometimes such points are well marked, more often one can only guess. The Lancoln Highway again deserves honorable mention here. Then, too, a picture-sque waterfall or an odd rock Jormation is vastly more interesting if one knows its name. Riding through the superb Shoshone National Forest in Wyommg, I have found this feature exceptionally well looked after, through Yollowstoms Party, too, the signboards name the rivers, passes, goysers and hot springs in profusion. In and lands, as those of the far south-west, a movement is well under way to

ln and lands, as those of the far south-set, a movement is well under way to mark the places where water may be ob-tained in the places where water may be ob-rined strongts such a region, how water may be of more value than gold, for the human thirs's sequalled by that of the motor in a region both hot and high the water in the radiator boils away with incredible despatch Where water cuttie far from habitations, it u desirable

that the sign tell whether it is good only for cars whether it may be drunk

whether it may be drunk
Map boards are often of
service, net only to the
tournst, but to the town
which sets up the peography
lesson A very good one at
Big Springs, Neb, signed by
the Automobile Clarb of
Southern California, systiage

"All." Decke to Pacific Coast" around by Des Mois card posted by the e the Buckeye Stateom how it may In Nebraska sev In Nebraska syr maps along the Line Highway urge the moto take extrain one. It way of econoling his treat is much remainantly uncluded the rough-should be rou

want to come. The City of Denver has in its municipal camp grounds a line map of the motor roads into its mountain parks.

the shooty reads take its mountain parks. The most theorephy and uniformly transport paths are those having a well segantied executive body with the persevenance and the "get-up" to solitifunds, the wideom to make adequate plans covering melacide of marking, and a centralized expenditure of moneys. The never or evenior highway associations have too leak left highway associations have too leak left highway associations have too leak left highway associations. mere was atom set the sevent marking to be done by losal labor and losal money, confining the general efforts to the boosting of the work. The result has been little uniformity in the work and many weak or missing links where the local residents are

unicorarity in the work and many weak or mining links where the local residents are too few in number or too poor to bear their shares of the expense or too midferent to undertake it when abundantly able in which translates with sparse population, through which translates with the pool-to-end markers for the high profession which a produced markers for the product of months of the probability of the product when it and the product of th and highway marking, as well as of their surveying and

proper surfacing
Until public sentument shall crystallise for national Until public sentiment shall crystalline for national most direct way for charging the user of a road, that of collecting these must be makeshifts. The most direct way for charging the user of a road, that of collecting tills every few mules, has been ruphtfully repudiated in this country. It would by no means be unfair, however to increase our state sustanched kennes fews, in particular, while every state's license must continue good in neighboring states, it would not be unreasonable to ask the transcentimental tourist to contribute something in the way of a transcent license fee to the states which he traverses. Then it ought to be possible to make a logal provision for the diversion of some small percentage of traverses Then it ought to be possible to make a legal provision for the diversion of some small percentage of direct tax funds from cities, counties, townships states or the nation for the marking of highways that are valuable for the many purposes of freighting, pleasure and business traffic

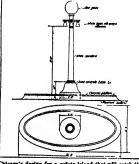
and Dusness rame
As a concrete example of centralized work an official
of the King of Trails, Wianipog to Texas, writes that
the painting of the poles on this route has been done
entirely by one man under the direction of the National Association It is paid for generally by the com-munities in which the work lies but it is continuous and uniform whether or not any particular community has andorm whether or not any particular community has footed the bill in doing a three-coat job, including several branches and elternative routes, but excluding certam stretches in Oklahoms not yet covered, the palater has put in about 2,250 miles of markers and has drives a total distance of more than 1,500 miles. He has been on the job for more than a year. The National Old Trails, from coast to coast, is ruju-rationally and the properties of the pro

has been on the job for more than a year. The National Old Trails, from coast to coast, is supplementing the pole markors with thousands of metal agmboards. Upon each two-their from post, set in the proper location, are two galvanised iron signs. The proper cost, it is 18 inches, is placed diagonally on the top of the peet and designates the highway, this is identiced no all posts. The lower one are it transversed shows the milaser to the several meighboring and terminal the milaser to the several meighboring and terminal third that the several meighboring and terminal trails. The several meighboring and terminal distinct These speedl markers are found, on an average, once to the mile from Los Angales east to Richmond, and, including some bannohes and loops. West of Renses City the Automobile Club of Seuthern California Sopherstead largedy with the National Old Trail Association in the labor and money costs. As the contract of the section of the sectio



The white posts stand out clearly, the two-colored globe is hardly htisfactory

ions communities along the way established a more or less haphared system or maxim, a minum year to mander the Mesociation sent two cars, manned by cross of two mon cars across the country from New Yerk to Sutherland Neb a distance of 1,750 miles Eight thousand standard rid white and blue markers were painted iron the telephone police of this section of the route Working in conjunction with the ubiquitous Automobile (14b of Southern California the Highway was commented with permanent steel markers from 1 h. Nev to Sait Jake was a few summer working with the or less haphasard system of marking, quite lacking in uniformity Three years later the Association sent two late in the same year; and this summer working with the ne organization, the work will be carried on from



Chicago's design for a safety island that will catch the

Salt Lake east to Omaha The Highway from Ely to San Francisco has been marked permanently by the California State Automobile Association. It is by such cancerns state Automobile Association. It is by such persistent action of the hydroxy associations and the various local and general automobile bottee that adequate provision for the marking of all our routes must event unly be made.

## Making Safety Islands Safe

TWO important purposes are served by the parners known as safety slands—traffic is controlled and pedestrians are protosted On much traveled; boulvards, lines of traffic, are defined and confection

the thoroughlare without danger of being run down. If all motor care were well run, almost only easily seen signal would be sufficient to allow the pedestrain to pause in safety. But prefettion must be afforded against the ricklossly driven sationolula and the machine that is not under control. This makes increasing a substituted lawner that the proposed in the control of the proposed proposed in the control of the proposed proposed in the proposed proposed in the proposed proposed proposed in the proposed prop automobile and the machine that is not under control. This makes accessary a substantial barrie, the biss of which should extend well below the pavement surface. Otherwise the cutire island may isplaced when struck by a heavy car There is the temptation to assume that in any case here a car runs upon a safety island, the driver must be

where a car runs upon a sacry issued in a diver must be at fault. This is not necessarily the case, and the as-sumption that it is is an unjust one. If a chauffeur can not see a sidely island he cannot be expected to avoid it. It is unfortunated that interest in these islands is too effect. dropped with their installate a so that seldom has much thought been given to making them really safe for motorists as well as for padestrians. It has too often been overlooked that islands so shaped as to ward off vehicles striking glaneing blows and so illuminated vehicles striking gianting those and so minimized as to be plainly visible especially at night are a prime necessity. If these are to be true islands of safety rather than sources of din er improvements must return the control of t made in their design which will cause them to be more

is minimized by safety islands at inter-sections. Every driver knows the path which will be followed by another car turning in or out or crossing, and reckless

chauffeurs cannot pass over to the wrong aide of the drive at these dangerous points of intersection with other streets

Morcover provision must be made so that pedestrians can stop at the center of the thoroughfare without danger of being

be made in their design which will cause them to be more plantly wishle, and as narty collisis a proof a possible. At bows intersections on frequently finds lamp. At bows microscients on frequently finds lamp. It is a proper standard on the plantlers which we have a proper fraquently trivial there is always the possibility of fraquently trivial there is always the possibility of strong many to the occupients of these are of the island. Some idea of the frequency of these accidents way be gained from the number occuring at 17st islands under the jurisdiction of the South Park Common ones, from nor Parkays of the 44th to 200 entires comparfrom mere breakage of the glabe to complete demolition

from men breakage of the globe to complete demolition of globe, post and vort the platform itself.

Most accidents at sifty shands occur at might. Its hed globe contours at these points furnishes but dim illumination so that it in v.l. impossible for the digits of the platform. And thoughout the set the extract of the platform. And thoughout the set the driver may fed citricity is set the danger signal if the supporting post and the island hos are userly institutionally and the supporting post and the island hos are userly institutionally and the supporting post and the island hos are userly institutionally in the dark Attempts him been made to go in the transfer of the control of the co

work out satisfactorily work out satisfactorily
Adequate thiunnanton of the base with white light is
the needed remedy. Small lights placed just below the
red globe if shielded by reflectors open at the bottom,
will make clear the size and shape of the platform without blinding the meterial. Greater visibility will also by the use of white island posts. Black be secured by the use of white aland posts. Black posts at safety islands were painted white last year by the two commissions having charge of the majority of parks and bouldvards in Chiraca. On the South bade both the lamp-post and the platform have been made white while only the post has been painted at the islands under the jurisdiction of the I me of a Park Commissioners. The platforms here being of contrate, were judged to be sufficiently light-clored and its week of the property of t pure white post

## Concrete Data

A BULLETIN recently issued by the I mipressive, tensile and transverse strengths and other physical properties of dense concrete vary with the per cent of cement used in the preparation of the concrete, and thereby enables the designer and the builder of concrete structures to effect the greatest possible economy in the use of concrete by requiring the fine and coarse aggregate for the concrete to be mixed in such propor-tions as will secure a dense mixture and adding only such a per cent of cement as is necessary to produce the strength or other physical properties desired in the concrete This bulletin is for free distribution on application to Publications (ommittee, University of Texas, Austin, Pexas



What happens when the safety island is not properly visible

## The Wireless incendiary

## By Jacques Boyer

I N certain cases radiotelegrams provoke fires from a front harmonic fine fart has recently been confirmed from the viry interesting superiments of M Gerga A Leroy. This chained as the result of several judicial examinations entitled to him, in which the disastrous effects of fire could be attributed to no other cause than Municipal Laboratory at Rouen He revealed the mis-Municipal Laboratory at Rouen. He revealed the mis-deeds of the wireless ly means of an apparatus which he has christened the igniting resonator shown in our photograph

photograph

This as set up for M. Leroys exportments consists, first of a glass bulb with four speciatrics one at each of the four sides as shown in the cut. Introduced the two lateral orifices passes and it trode of brass and these electrodes earry mur meter a rice with the eigener with coment into that form the intrinsistance of the boles. These electrodes are bored at their mnor extremities to receive subsidiary electrodes of platinum, copper from brass or carbon in various forms while the outer ends are attiched by means of a thumb-screw to a loop of copper wire from balf a yard to a yard in diameter. In brief M Leroy has designed this system to be oper-ated as a resonator of the classical Hertz type but with the spark occurring in a closed vessel in contact with various inflammable substances which are there submitted to test. The upper aperture in the vessel is closed by a stopper through which pass a manometer a thermometer and a drainage tube with a cock it the lower opening gives passage through heavy packing to a wire that supports inside the vessel a light table of mice on which are placed the inflammables for test also to a second drainage tube with a cock, which

meets the upper one already mentioned

The entire bulb is immersed in a bath of oil of vaseline, itself onclosed in an inverted bell vat Heating is accomplished by aid of incandescent light-bulbs, the points of which are broken off after immersion in the oil in this manner the internal vacuum of the bulbs draws in the oil, and the current thus produced in the liquid enable the experiment; to vary the temperature of the test at his will. When it is necessary for this to exceed 50 degrees (Centigrade) the glass bell is replaced by a less fragile receptacic of sinc or brass.

On the other hand the drainage tube communicates.

the surrounding air which is introduced into the builb by an aspirator attached to the tube Finally, ance the good Rouenese chemist proposed to study the phenomena of slow oxidation and of latent combustion which can be manifested by certain substances, he evaluated these items according to the amounts of car-bon dioxide liberated. It was therefore, necessary for him to purify the air, and for this purpose he added to the experimental apparatus discribed above, tubes containing potash or sods and sulfure acid or calcium chloride in order to free the air at the beginning of all canonical in order to tree the air at the origining of artraces of carbon dioxide which it might contain. Den he passed the gaseous current that energy from the bulb through several other vessels containing baryta water. The quantity of barium carbonate formed enabled him to

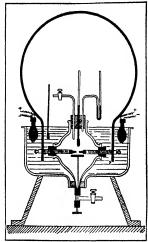
of the quantity of the slow combustion.

Once this sguiting resonator was ready for action, M. Leroy projected upon it feeble Hertsian waves producing these by means of an induction coil with a

d meulator injected in the This transformer receives at vacuum the primary a maximum intensity of some the primary a maximum intensity of some 20 amperes and gives a secondary spark of 45 or 50 cm, it operates with continuous current from the city service, which is interrupted with a mercury jet interrupter. As condenser of the oscillating crouit, he utilizes simple sheets of window glass covered with tin foil suspended vertically by means of glased yarn, and presenting a quadruple armature of surface I motor by 14 meter A large, flattened metallic wire and a double spiral of 50 cm diameter constitute the transon antennae as shown in our photograph

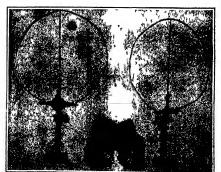
This rudimentary apparatus enables the skilled experimenter to show without doubt the incendiary action of the Hertsian waves, although their electric intensity is a minimum in comparison with the power of the large wireless stations now in service In particular M Leroy has set up at some es dutance inflammation of combustible materials such as guncotton, tinder, stone materials such as guncotton, tinder, cotton, worsted, tow, paper, etc. For example, by his observations upon small bales of ostton enclosed in jute wrappers with iron hands, as this material is ordinarily packed for shipment, and of which one of our figures shows three in a pile, he explains in the following fashion the mechanism of so-called spontaneous com-bustion which at times bursts out in warehouses or on board ships

In the course of handling one of the hoops which encircles the bales of raw cotton breaks or comes losses under the action of sheek or some other cause, and a small fragment of the metal projects in such way set to form a ministrue Estrainar resonator. Then under the



General arrangement of the igniting resonator as set up for experiment

influence of the wireless way a sent out from some station, sparks pass and mine listely inflame the cover-ing of the cotton in their imm dust vicinity Equally, the contact between the metalli bai ds of the bales piled one on another in a car or packed in the hull of a boat, may establish an electric circuit offering the conditions of capacity and self-induction necessary for the producor supercive and semi-induction in cessary for the produc-tion of the phenomena of res mane. In consequence, when the circuit finds itself into trupted by imperfect con-tact between two bales incendiary sparks, apt to inflame the cotton, are likely to be produced.



The igniting resonator by means of which the wireless waves have been convicted of incendiarism

### The Locon otive of the Se

THE ideal condition in any transportation business is when all carriers are loaded and is mortise. This condition can soldom if ever be fully realized, but in accordance with the degree to which it is approximated accordance with the degree to which it is approximated deviateds will go up and cost to the consumer will go down. The steam railroad is able to carry goods occapily over long hauls for the reason that single care can be cut out of a long train and left on sidings to have a portion of their loads removed. If an entire freight train had to lay up at every station for which it cars that to lay up at every station for which it cars goods, a transcendings of left had would be a lifelong undertaking

goods, a transcontinental freight haul would be a life-long undertaken motor baulogs has found inscall con-The dealer in motor baulogs has found inscall con-tractions and the second of the second money to have an expensive truck and its expensive drives laid out for an hour or two while loading or unloading or both are accompladed. The answer to this has been the trailer, and the development of procedures under which the truck is sidelom or never loaded, but simply baulo trains of trailers, these it leaves to be loaded or unloaded. The second of the second of the second of the second trains of trailers, these it leaves to be loaded or unloaded. This can be carried out more of loaded, but simply baulo trains of trailers, these it leaves to be loaded or unloaded. This can be carried out more of loaded for unloaded in the second of the second of the second of the motor transport is practicable at all. But there is one field of transportation where the use of the train sprinciple is limited—and that is on the water. On canals, make harbors, anywhere where smooth water can be guaran-teed for the duration of a trip, a little tug can shunt a second of the second of the second of the second of the loaded. But in rough water towing becomes out of the loaded. But in rough water towing becomes out of the loaded. But in rough water towing becomes out of the loaded. But in rough water towing becomes out of the loaded but in rough water towing becomes out of the conditions which would bankrupt a railroad in a week, every ship that carries coam freight has to be followed.

every sinp that certies ocean irreignt has to be ide, during a round trip, for precisely the time which it takes to load and unload her completely The problem of reducing what our French con-temporary Le Genie Civil cells the period of immobility comes down, in last analysis to the separation of the propulate unit from the carrying unit Immobility on land is reduced to the minimum when the locomotive is an are reduced to the immutant wast the spoomoure is divorced from the froight oar and made a separate unit, or when the engine is divorced from the truck body and the trailer since goes loaded. If the motor element is inseparably tied to the eargo-carrying element, it is obvious that when this latter is not in motion the former obvious that when this latter is not in motion the former obvious that when the latter is not in motion the formes cannot be if would therefore seem that the problem of reduning immobility at see came right down to that of making the tow more universally usable, or that of making the tow more universally usable, or that of making loading and discharging more nearly instantaneous. As a matter of fanct, there is a maddle ground, which is perhaps best illustrated by the Shall system developed in England. We give on our opening page daggrans of this system.

It is pointed out that the course taken by the efforts to maintain a merchant fleet in the face of submarme depredations has been such as to focus attention very depredations has been such as to focus attention very strongly upon the conception of hull and machinery as separate entities, rather than as the single indivantle whole which they have always harvefore constituted Dalays in building ships have arisen almost endiring from trutble in getting the engines made and delivered It has therefore been quite natural torget imbued with the date that the senine does not necessarily have anything to do with the buil, and it is along this idea that the

she bull, and it is along this idea that the Boell system proceeds
The propulsion of the ships bullt under this system is electric. In general the motor and the generator are separate in-stallations. The latter consists of a Diesal sagins or a steam turbias, coupled with an alternator. The propulsary group in-ductes the helical propeller with shaft and reduction general diversity electron solder. The screws and electric motors ordinarily constitute nant of the agreement of the

reduction gears, driven by electric motor. The screws and electric motors ordinarily constitute part of the sarge-carrying bull; during a voyage thuy are someously up with the geocetting unit. This generating group is removable from gone ship to account of the same content, it is taken out of one buff and put in place in another by second of the place of the motor of the content of the same of the content of

# Southern California's Burning Canyon

## Shale-Bearing Rocks Whose Slow Spontaneous Combustion is Manifest in Clouds of Smoke and Steam

"HE spectacle of rain, fire and flood all occurring at the same time, is not an unusual sight in some of the canyons near unusual sight in some of the canyons near Los Angeles The most notable sample is near Santa Monica which is on the southern oses of California The pre-apticus sides of the canyons debouching into the Pacific Ossan in that vicinity are somposed of thay and shale Whenever rule falls on these rocks, great clouds of steam rise from the canyons. The canyon orwest and faces are cowned by vitrided rook burned a dull red

this reported by the early historians that when the Mission fathers visited this region 150 years ago the natives avoided these places. They claimed that these mysteri ous canyons were the abode of evil spirits and the Indians could not be induced to guide the priests to their vicinity

guide the presst to their vicinity.

The three photographs accompanying this article were made during a recent rainsform and show the bay of Santa Monics and its relation to the canyons, and the canyons themselves with the rising

and the carryon monature and gas During the infrequent earthquakes in this region the upper surfaces of the canyon sakes give off authurous gases similar to those noticed during rainstorms

notioned during reinstorms. Actual flame has also been reported in one of those canyons, and similar phenomens are said to occur at exertain places in Stants Bartars County, honce the occasional newspaper accounts of active 'volcanors mass the coast of California libe phanomens are widently due to fires in the petroleum-bearing shaler which crop out in these regions. In cause of the first is uncertain, they may be started by lightning or they may be a case of spontaneous combustion. Mesers may be a first of the first shall be supported in the second of the said of

M. S. Arnoid and it is someon, who investigated and subject some years ago, say "This unique variety of metamorphism has been at work locally in many regions of bituminous rocks in work locally in many regions of bituminous rocks in California, where a process of combustion of the hydro-carbon contents has altered the naturally white, soft shale to a rock of brilliant rose or brick-red color and rendered it in cases hard and vesicular like scorincocous rendered it in cases hard and vestouisr like acoraceous lava. The resemblance of the products to those of volcances and the existence of centers like solfataras where the process of turning has been going on during the last half-century has given rue to the statement that there were living volcanic vents in this part of Cali formis."

fornia."

In drilling oil wells burnt shale has been found at depths of from 90 to 1,000 feet, proving that the burning has taken place deep down within the oil-bearing formation, as well as at the surface

## Tumbleweed Becomes a Crop

ON the farm, as in other places, the best way to deal with an enemy is often to make him a friend Sweet clover, now a recognised, valuable forage crop, was

for many years among the most detected farm weeds of the Middle West The Rusthirtle, a tenacious weed of the Intermountain West, has made its debut as a farm srop under dramatic circumstop under dramatic droum-stances. Stockruisers in dreight-stricken regions out it and ensied it extensively past season in some pp it was the veritable sal-ipp, of a discouraged far-g, whase planted crops of fadled bim. The Russma, pite slong its minestes another has an engines surjan small needle-lifes spikes, it they in the side life in its testice. The size occase, a dast-class field for Rep-



When it rains the canyon bettem is flooded and the rock walls give off

a bulky plant often several for the wide and high the will flourish in desertike places where cactus is the only other



Stratification of the rock in the burning canyon

vegetation The Intermountain West does not call the plant by its original name. Its home-made term, the

tumbleweed as far more expressive. The dead plant breaks off readily at the ground in the fall. Then the wind screes it. The tumbleweeds stru ture is so tough yet resilient, that a plant will whirl for miles before the wind only stopping when hung hefore the wind only stopping when hung up by a fence, a ditch or some other ob-struction. So out of proportion to its size is the weight of the big plant that it will highly fly high in air during a

hard gale
Children in the Dakotas Montana,
Wyoming Colorado Idaho and Utah, find tumbleweed a splended late fall playfellow I we big weeds are harmssed to a string, and in front of a wind they go hurting down the street driven by shrisking, hisply boys and girls. At other times the word becomes a kite, attached to a long cord dangling from a fish pole

Another western plant formerly re-garded as undesirable is yucca or soap-weed which in the silo is found to make edible and good livestock feed. The plant

equity and good hydrocause Maxicans and Negroes make a soap from its juice. It is also called the Spanish bayonet, and the dagger plant from its

## Electric Lighting Forty Years Ago

A CORRESPONDEN I brungs to our attention the Collowing introsting passage which he has translated from 1 all llustration Papenoals y Americana of Madrid issue of Ianuary 22d 1880.

Has Thomas Alva Eduon solved the famous problem of economics and practical lighting by electracity Scientific, tricles and great gas companies of the new and old world have occupied thomselves with naught the for the eart with the contractive of the lse for the past weeks

to date none can answer this question in a correct BUBE of the world A newspap r of New York the matters expresses itself in the fellowing manner Mr Ldison's lamp triumphantly withstands the tests of time it is unquestionable that he has given solution to a difficult problem, that of creating what we have with difficult problem, that of creating what we have with such anxiety waited for in short a new practical lighting system economical and usable by the majority However we consider it our duty to acquaint our

readers with what is positively known to date regarding the latest discovery of F dison demonstrated for the first

time in Menio Park on the night of December 30th By many experiments the calchrated physicist has suc-ceeded in placing small pieces of Bristol cartulin recut in the shape of a horseshoe into an uncandescent material less fusible than platinum and which obtains a degree of hardness equal to that of granite by the passage of the electric current

The editor of the SCIENTIFIC AMERICAN claims to have read a newspaper by the light of an Edison lamp hung at a distance of thirty-five meters

These electric lamps may be attached on the wall in the

manner of gas brackets

It seems uscless to tire the attention of our readers with a description of the generators and machines which tain electric illumination in all the houses of Menio Park for a space of ten consecutive mehts with satisfactory re sults to judge by the socounts published in the news papers Some of these as-sure that lighting by the electric lamp will bring a cheaper result than that sub-Some of these ascheaper result than that sub-mitted by the most inferior oil, but as we have not yet sufficient data, we limit our-selves to express our wish that all doubts will be done away with and that Alva Edison's new invention will Edison's new invention will be a worthy crown for his already immense reputation in the scientific world.



Sairin Massica Bay, with the borning impren just discornible at the feet of the long wharf



The "Argus," a scaplane carrier built by the British during the war, which carries 20 ecoplanes in a hangar below deck, and has an upper flying deck, for launching and landing scaplance, 525 feet long by 65 feet wide which is clear of master, embeated; and deck structures of the contract of the contra

# The Seaplane Carrier "Argus"

## A Ship With a Five-Hundred-Foot Starting and Landing Platform for Seaplanes

 $A^{\rm I}$  the opening of the war in Europe a first-class cargo and passeager ship which was 5.6 feet forn, 98 feet beam and 40 etc deep was being built for an Italian shipping company. Becauseful for rush of war orders work on this vessel was discontinued but in 1016 the British admiralty deuded to take over the ship and transfer rint on large snaplant is zero; and thus work was done at the Wm Beaudmore & Co s yard on the Clyde where the ship had been

and down

The admiralty had aiready done some work along these lines in
the case of the 32-knot bettle cruiser Funous which ship has
already been illustrated in the Sciphyller American. In the case
of the Furous a flying dock extending from stem to stem was built above the original structure of the slip and because of hei length a long stretch of free and unobstructed plutform was available Due to the obstructions presented by the large smokestack the length a long stretch of free and inconstruct a platform was available. Due to the obstructions presented by the large smokestack the bridge, and the tripod inast it was not possible of course to utilise the whole seven to eight hundred feet length of the vessel as a continuous thinking. tinuous platform

tinuous platform in reconstructing the 'Argus however it was determined to provide an absolutely closer runway for the white 535 fost length of the vassel and also to build within her a large hangar capable of housing 20 sexplaines and the various workshops storroroms etc. what are disturbances are produced by the upper attructures of a ship when driving at spord showed that to get the bost results the space between the hangar roof and the flying deck must be left as open as possible. Consequently the flying dick was carried upon an open frame-work consisting of steel columns braced diagonally as shown in the accommopanying illustrations.

It was also found that the amission of gaoes through the usual fit was also found that the amission of gaoes through the usual

It was also found that the emission of pases through the usual vorticed finnels of a steamship produce service are disturbances, and consequently it was decided to connect the up-takes from the bodies placed below the flying deek, which would lead the gases to the stern of the ship and there discharge them. These horizontal funnels are provided with expansion joints, and they are kept cool by means of vanishing fans. At the after-ends of the funnels are large discharge class such about 10 feet in dismetter which are driven by 74 brike horse-power electrical motors

The flying deck is tirely clear of obstructions. There are no functed masts or pit is huse visable when the flying platform is in service. The small pils shows shown in one of our illustrations can be raised position, but via no gain into action it is brought down undit as roof is flush with it ellipsic clear. There are two destricts forward for lifting the plant from the water, should they alight there, and off the flush of the flush of the state of the same purposes. Of the clear flush of the state of the same purpose of the state of the same purpose. Of the state of the same purpose.

Below the flying del there has been built a seaplane hangar which is 30 feet long by 68 f 4 wife with a clear interior width of 48 feet designed to accomm 1 tr 20 seaplanes

designed to accomm it all sequences. This hanger is built if we the original shelter deck of the ship, the roof above being unted on deep web frames. These frames are carried up the ship s at to a height of 25 feet 6 inches above the original sheltered it. I he roof is built of steel on widely spaced in transverse garders as 11 agricultural beams and there is a clear headroom in the hangar f d'out 20 fest. In the hangar is a thermo-tank heating unit un i on the walls are radiators, racks for carrying torpedoes, and also at everhead runway for transporting the

In the storerooms are nonmodated spars parts, wings, propellers, torpedoes and bom's and forward of the hangar are large writershops fully equipped with machine tools. One of our illustrations shows part of the writering the statement of the property of the writering and provided within the mental protective netting surplane engages and privilers which has the usual protective netting around it

The navigating bridge houses for officers, etc , are placed forward The newqueting bridge houses for officers, etc., are placed forward under the frijing dock and only the chart-chouse ever appears above this dock. The chart house so capable of being raised above the dock by hydraulic part. When in the raused position, it commonly dock by hydraulic part. When in the raused position, it commonly a clear allround vice. The chart-house travels in vertical guides, and its in raised and low are day a hydraulic raim.

There are two the tracilly controlled elevators for lifting the altring the hanger to the flying dock, and when those has not in



Stern view showing the everhang of t



Bow view. Note the methe









deck and two of the 4-inch runs



persing the Sying deck



The "Argus" under way. Note the clear Hyling deck and the smoke discharged aft. The uptakes from the boilers lead to two horizontal financis extending ait, one on each side of the ship, which discharge the gases astern, where they do not provoke ar distributes or contains the first many.

use, the hatchways are closed by sliding pistforms. The after lift is 60 feet long by 18 feet wide and the forward lift is 70 feet long by 86 feet wide. Each of these can lift the largest between planes with the wings folded heat: As soon as the pigases reach the flying desk, the wings are swung forward and coupled up and the machine is ready for flight. To facilitate the landing of the atriplanes on the after part of the flying deck at night time, special illuminating arrangements are provided for the guiding of pilots. In addition to lamps at each side and across the flying deck to guide planes when handing at might for guidance of the planes in minesurerang during davlight. To retard the arreaft when they land, a special guirang davlight To retard the arreaft when they land, a special grangement of the mattresses is provided.

matriesses is provided in addition to the storage for aircraft in the hangar, provision is made for carrying them on the flying deek, in which case a timber palisading can be raised about this deek to ack as a wind sereen like palisades are so arranged that they can be suced simultaneously 14 feet above the dock level. Outside of and aircumd the flying deek is fitted a wide safety net

is more a wide sately net.

Two signal and wireless talegraphy masts are arranged as shown above, so that they can be lowered flush with the flying deck. There are special contrivances and winches for overthasiling all slack rigging, this also applies to rangefinder and gun control instruments for use with anti-aircraft guns

with anti-arcrait gues.

The ships are with four 4-msh satis-freedit gues which can
The ships are a submarines and two 4-sheek quickfire gues.
They are so placed as to afford all-around said overhead protection.
Our thanks are due to Messer Wm Beardgares & Co., the builders
of the "Argus, for our photographs and to London Engineering
for the descriptive matter of the very interesting ship

## Valuable By-Products from Gold Dredging By Arthur L. Dukl

THE mining of gold by the dredgar process has been practiced throughout the world for many years, and in this country the dredging senters of Californa have enabled that state to remain the front rank of gold producers in spite of the virtual suspension of hydraulie mining and the decline of many of the larger lovel cames Many millions of dollars' worth of gold are annually taken from the sarrb by the California gold shape, and bundereds of sorre of gold are plowed to a depth of from 15 to 45 feet in the quest for the gold. Under ordinary circumstances, when land has been throughly dredged it is abandoned, and the up-turned sed is left in the form of

long hills of cobblestones just as they are delivered from the dredge stacker Whatever silt and fine material is excavated usually seeks the lower levels through the interstrics of the stones and is thus lost Practically no vegetation grows naturally upon the failings piles, and until recent years no effort was made to utilise the great mountains of rounded stones raised by the lee lace

The lands dredged were usually rocky river washes barren of vegetable growth incapable of raising rops and in many cases were subject to overflow and thus rendered unsuitable for permanent use subject to overriow and thus rendered unsuitable for permanent use Occasionally, however an orthand that or cultivated held would be embraced within the dreiging are a suid the value of the land for mining being greatly in excess of its value for significantly or horti-cultural purposes the lands passed to the dreiging companies and were mined

Fortunately for the state the proness of a lang men were made up of the type that blave of an devel praje (very resource of their community. They had other interests in the vientity—orthorder, anchoes electric radicody—of the yield radicological to the state of the state of the properties of the properties of the state of the good from let a the surface. So while the number of the gold foreiges was multiplying in the set in for newer dredge organized a company to conditively men its in utilizing the millions of toos of colobelectors truncl up by the latter of the state o Fortunately for the State the pioneer dr Iging men were made than a hundred thousand dollars was spent it an eff rt to crush th tailings. Owing to the extreme hardness in dithermin led smooth character of the cobblestones however it. I first attent to produce a commercial product were failures as the ordinary rock-crushing machinery was inadequate to meet the strain. However the operators persevered and sunk another hundred the usend bilars in new machinery designed especially by their engineers. With a plant With a plant built almost entirely of minganess steel the cobblesiones were

With practically unlimited quantities of crude material available near their plant, the dredge men thought the returns from their new industry would equal that of gold dredging but they soon found that it was necessary for them to create a market for their product. Their competitors who sold natural crushed rock of a softer nature near competitors who soid natural crising rock of a softer nature spread reports of the extrue. hardness of the new product that pre-vented it from knitting properly when used with commit and a great dead of pioneer work was necessary to get the new material intro-duced into nearby markets. But the men back of it were fighters,

(Continued on page 640)





at the how of the "Atguit" showing forecastle dock and the supporting structure for the flying dock







A general view of the Cheoah Dam during construction

## Tennessee's Big Dam

I N connection with a big aluminum refinery at Mary ville Tenn a damwise empleted last winter after two years work that ranks among the very biggest fits race. In this country it is suijassed only by the Roosev lt Dam—and by Niagara I alls if we are to

Dam—and by Niagara Isils if we are to permit Nature to ester her hand work i the contest for priority
The new dam is located at Cheoali
miles from Knoxville The services of 1 200 men were required continuously in its I soon mean were required continuously in its construction. It will yield 80 000 h responser when arrangements are completed for the utilisation of that amount an lit is to be supposed that this will be er ought meet the demands for a wilk ever of such a voracious consumer of cleatricity as the refiner of aluminum

The dam is built in a deep ravine with towering natural elevations on both sides Accordingly the discrepancy between its length at bottom and at top is not so great as is often the case it is 350 feet long at its At the base it is 175 feet thick tap ring to a width of 12 feet at the top. Its height width of 12 feet at the top Its height from the lowest foundation footing to the crest is 225 feet while from the surface of the water to the highest point of the dam is 210 feet. It contains 200 000 cubic yards of concrete—and a cubic yard is a good deal bigger than the average intuition good deal olgger than the average intuition would picture it Perhaps it would be more impressive to point out that 200 000 cubic yards is the equivalent of 5 400 000 cubic feet and to bring the matter still

cubic reet and to bring the matter still measure home a rubic foot is just about twice as big as the average apartment-house serving of ice. So if the dam were ice and available for distribution to a single consumer it would last about 30 000 years

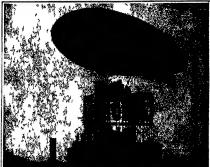
observations or a series constance it. The contribution of the con the river below it raises a spray over 100 rest high—a spray that can be compared only with that of Niagara. It is suggested that had it not been for the heavy raise of early December the process would have taken perhaps three times as long. To dispel any doubt as to just what the figure 80,000 horse-power means, we are told that the

combined consumption of Knoxville (hattanoogs Nashville and Memphis for electric light and power Nashville and Memphis for electra light and power te but little over 70,000 horse-power. These cities had an agggregate populatun in 1910 of a third of a million and doubtless have increased ma-terially from this figure in the eight years that have

departs trans.

As interesting item, that puts the project almost is the class with the (atakili Watershed which submerged whole villages and long stretches of public road as found in the fact that over a milhon dollars

wirth of construction work rearly completed for a new branch of the Southern Ralls sy was bought paid for and flooded by the builders I the dam. The rail road relocated its line at a high r grade and was glad to do so in view of the big increase in business to which



Dirigible landing on the roof of a hotel in Cleveland Ohio, during a recent trial flight



it can look forward as the result of the operation of the

The water went over the top of the Cheosh Dam on

Friday, December 13th—so it is obvious that the aluminum people are not a bit superstitious. It was hoped to have the dam at work at its full capacity by March 1st

A PASSENGER air-line ostween Cleveland and Akron, Ohio and other ontes within a hundred-mile radius seemed cites within a hundred-mile radius seemed a thing of the immediate future whon Ralph H Upson, a prominent sero engineer, steppod out of a dirightle balloon that had landed on the roof of a hotel in Cleveland a busiest metropolifan sestom at 7 80 o clock on the sreaming of May 23cd The ballson carried Mr Upson and Major C H Marsarville head of the array-

The balloon carried Mr Upsen and Major C H Maranville head of the artugnary ar training station near Acron Chin, from Airon to Claveland to be gueste as the state of the stat

## Recent Explosion of Kaint Volcano, Java

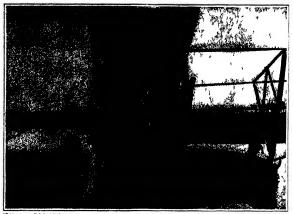
Recent Explosion of Kalet Volcano, fava CN, May 20th, 1918, the volcano of Kalet in greatern Java burst into violent serupiton sensing great destroction and extensive loss of life in the District of Brungas and in the vicinity of Biles. S' S loss 112° E) Unreplectograph absets Kalet volcano at one of its more active genglas, these Kalet volcano at one of its more active genglas, when it was graving off moderned closed of pleasa, and alovity adding to the very low their employed member of the musicy tritings solving has built. The control of 
weathering thesth and destructions are interested in the conlines are into wide, and proleting lists our upper atmappings a cloud of dust that prainisted for zereal years and produced the most high this deviced men had greated and the colors of the ingent that schools are deviced by skinlinely colored tought to yellow the colors of the colors of the produced with the colors of the produced with the colors of the same of our daily papers have reconsily cautioned us to be to the lockout for such phenotheneas again. However there is no information yet at head to indicate that this reseat explosion of Kallut attained the violence requisite to produce such

Volcanoes are predomin antly developed along great breaks or faultings in the sarth's crust, and in or near the present sea coasts. It was long believed that these two facts were of great significance oncerning the origin of volcanoes but many have also been found in the contract of the contract of the contract of the contract and fractures can have been of any determining value and the series row has been

modified it has finally been concluded that the heat betrayed by volcane activity is probably a remnant of the original heat of the earth when us a much more highly heated state and that the molten rock or magma is largely a remnant of the original molten globs. The water whole escepe as steam in nearly all eruptions—for it has been recently proved that it is water—as probably in large part an original constituent of the molten rock, and is associated with a number of other posses which also enter into the composition of the rocks. The probably is the entry than the composition of the rocks. The probably is the entry that the composition of the rocks. The probably is the probably in the next consistency within the control of the control of the rock. The probably is the probably in the control of the expensit of the earth. In the case of the least volcant are of the segments of the earth in the case of the least volcant and commently significant explosions seem to be the sudden raised of stresses which have been allowly assumulating for centuries until the entited point of the superplacent crust has been acceeded.

## The Transatiantic Scapiane of the Future

THE Navy has announced that the flight across the Atlantio was undertaken as we showed instead with a fine of the state of the world be capable of flying to the European submarine some under their own power Although the close of the war ended the need for flying the hoats over for purposes of war, the Navy decided to go absed with its pregram for the purpose of obtaining the valuable data which would be sequend in a transatiance flight.



Wreckage of the lower left wing of NC-3, due to pounding of the seas in heavy weather Note that

We publish two photographs of NC 3 taken upon her arrival at the Asorrs which are of extraordinary interest bosonses of the lessons which they teach for as we noted last week, Admiral Taylor in proposing the associated that the second property of the s

Therefore, a fyring boat if it is to deserve the name must be sowersthy, not merely in ealin weather but when the wand is string and the seas are high. These too photographs show that in the present state of the art we have yet to build a plane of the type which Admiral Taylor called for in his original memorandum. Two out of the three NC boats were forced to descend in trong winds upon a rough see. One of these anix while being towed to port, and the other was completely wrecked in what is obviously its most vulnerable part namely, the lower wings. Here pictures testify at almost to the strength and the fraintly of the wings triudium choice to the strength and the fraintly of the wing triudium control to the strength of the through the orderal intact. The lower wing-beamshare in places and apparently in line, what collapsed were the transverse miss and the

curvas covering. The beat and the outrigger frame for earrying the tail seem to be in good shape and the tail itself except for a slight tear in the canvas seems also to have come through in pretty good condition.

first and obvious les sor is that it will never do to place the present type of canvas covered wing so near to the surfice of the water One way out of the difficulty would be to abandon the lower plane altogether ex-cept perhaps for the middle third of its length in the way of the engines and build the future flying boat as an outand-out monoplane with the carrying surface 15 to 20 feet above the sea. If the of the monoplane wings would be too large and the raising of weights would render the flying boat too unstable the only other plan would be to provide lunger at the panel points adjoining the engines and have them so arranged that the hinge could be quickly unlocked a soon as the boat reached the soon as the boat reached the water and the wings swung back into the longitudinal position and made fast to the boat structure This of course would involve build-

ing a continuous boat up to the tail structure in order to provide a point to which the swung back wings could made fast. A boat of this type with greater beam for stability could be handled in a rough sea.

As to the question of what type of anylane would have the but chance of crossing the Atlantic is a non-stop fight it is divided between the small ample-engine high speed plane and the large multiple-engine plane of lower speed. The former has the advantage that the number of hours in the air is considerably less, and there is a greatr possibility of getting a rose on a favorable day before a sudden change for the worse of weather conditions occurs. On the other hand, the breakdown of the engine means the loss of the whole trip

test now Britsh onnon favors the construction for a straphtaws flight like this of large biplanes, carrying a plurality of engues five aix or seven as the case may be with the enguine arranged in banks within the ancelle and with chain or shaft transmission to the propellors With a plane of this type. two or more engues might be out of service without rendering a descent necessary. The placing of all the engues in the nacelle and under cover would make it possible to effect repairs change spirk plugs etc while the machine was in

In dosing we wish again to bear tribute to the pluck and skill with which Commander Towers navigated his wreckel erift in rough water for over two days over a distance of some 200 miles. Everyone should see the moving pictures showing NC-3 driving into Ponta Delgads harbor before a stiff wind and wa



le in parties the main structural framing aboving seaves stripped from the lower wings. The main structural framing stood the severe test

# Inventions New and Interesting

A Department Devoted to Proneer Work in the Arts

## A New Bank Desk By Coxymine Wilson

A BANK desk of great convenience to the banking and commercial world has recently been invented by A E I alls a bank employee of Chicago The Palis desk proves its efficiency in that it reduces floor space ordinarily used by one half and increases the efficiency of employees from 10 to 15

A little adjustment of the top which may be raised or lowered at will as any ordinary lid and practs the desk becomes a standing desk for assorting checks, etc with hid down or a bookeeper's desk for computing machine and ledger, with hid

When the top is folded back the book When the top is forced back the book keeper aits on his shool oblivious to his best pals or the pretty girls at the next dasks because he is shut off from overy

uses because no solution from overy thing but the business in hand. On the left side of the lookkeeper are two drawers the top of which may be used for a shelf on which to place the work for recording. On the right side is another shelf somewhat lower than that on the left which is used for lodger rack and ledger. The center space accommodates the computing machine on

its own stand
Dosks range in price from \$90 to \$125 according to requirements. They are made to order to fit any bookkerping or computing machine used in commercial or banking work and to carry any I see leaf ledger rack, or tray or the larger sheets of the Boston system A popular sales as two feet two inches long five feet sax inches wide and 41 or 43 inches high. An adjustable light with improved knuckle joints which enable the light to be knucke foints which enable the light to be used freely in any position accompanies the desk. Many I anks of Chicago and other large cities have installed the Falls bank desk in the last year and found it

## The Motorcycle Turned Taxicab

IT has remained for the English to develop the conventional motorcycle with indecer into a public taxicab. By building a somewhat heavier and longer than usual the English have arranged it for carrying two passengers while the motorcycli carries the driver all as shown in the accompanying illus-



A deak that can be adjusted for standing and sitting jobs

tration. The sil car is provided with a top and side curtains making it available in all kinds of wather. The springs are said to be projerly d signed and distributed so as to take care of roal.

irregularities All cycle taxicab covers any dis-tance in better tance in better automobile and the fare is on siderably cheap r

# A New Idea in Hand Punches

No other punch ated all day with the mechanic as the one shown in the accompanying illustration ac

earding to its in ventor. And he proceeds to explain this ease of operation by pointing to the absence of long clumy handles the fact that the operator is brought close

to the material the punch marks are foll w d quickly and accurately, the pi l is extremely light in weight the at suick and positive only half a turn of the lever

being required to drive the punch through metal the handle above the center keeps the punch naturally upright the punches and dies are more easily changed the punch may be easily clamped in a vise if desired and there are no pipes to fit or adjustments to make

The new punch is intended for the tool kit or shop It is powerful compact port-



in the illustration may be deep throat and one-piece disappearing strappes, giving a to punch and punch mark is operation. The design pegs operation. The design penulta as shocts to be punched with one-operation. Also, the design is such as practical altimate punch breakage, and peak will not leave a bur on the metal cording to the inventor's claims.

## Collansible Tube Holder

Collagable Tube Heisler
TYEE use of collagable tube containers
I for tooth pastes, cold creams and telest
articles is too well established to require
extensive explanation. And it as also well
known that such tubes, convenient as they
are are open to the one objection of becoming unagably when these consistests are
pretty well reduced and the tube is more
cless of a shapeless mass. To overcome
else of a shapeless mass. To overcome
Beoddyn N Y, has invented a simple
Beoddyn N Y, has invented a simple
uvelanged holder which acrows against a
wall and which serves to hold a collagable
tube in an unprahip topation with the spout wan and which serves to note a conspanse tube in an upright position with the spout below. Thus, to dispense the contents the user merely has to press the collapsible tube held in the holder starting at the upper end and going further down as the contents become less and less

## Shower Bath for Mules

ONE of the large mining companies has installed shower baths for its mules that work in the mines. The ideas of humans treatment for the laborer that are being used by all the large companies have here extended to the animals, and the tired mules or horses the animals, and the tired mules or howese that have worked all day in the tunnels of a mine are refreshed by a best that leaves than relaxed and ready to read. It has been found that the animals that are taken care of, given a good place to sleep and otherwise treated kindly last such lenger on the job and do better work. The framework of the shower batk ag-paratus at lies a still into which the mule paratus is like a stall into which the studies in driven From a water pipe not up of the structure three sprays are placed at equal distances so that when the water is turned on the animal a back us coverned with spray. All the dust from the coal is washed away leaving the beast fresh. At first the multies were animaly as period and fearful of this constrivance but in a very short times they needed no pre-massion to enter the stall for a shower



Motorcycle with special sideous used in England for taxious services



# Dependable

Unfailing dependability is a characteristic inherent in every SERVICE Motor Truck.

Wm Greensbery, in charge of transportation for one of the large depart ment stores of the middle west, speaking from a broad experience says

"Our Serotes Trucks are giving wonderful results For the post six months we have covered delly suburban runs of 125 to 150 miles The trucks have not been laid up for repairs a single day and have never had to be toxed, the running three snows and the soft roads of apring

SERVICE Motor Trucks are so scientifically designed and all parts of the assembly are so carefully co-ordinated that dependable performance is assured

SERVICE MOTOR TRUCK COMPANY, WABASH, IND , U S A



## Recently Patented Inventions

Brid Descriptions of Recently Potential Mechanical and Electrical Divices, Tools, Form Implements, Elec.

Permining to Apparel

POUR F II List assar Element Houseroam C o 77 Harder S Cut Financisco Cal Investor Houseroam C o 77 Harder S Cut Financisco Cal Investor House to toolect to provide a price of the Burke Are Seasile Wash The
Investion has for list hight to provide a price color to case and the provide provide a price of the color of the provide and the provide provide provide a price of the provide provide and provide provide arrange of the provide provide arrange of the provide price of the provide provide arrange of the provide provide arrange of the provide 
Electrical Devices

ELECTROMAGNETIC 11 BB. JEN1ING
DEVIGE—A. Page 18 102 Magnetic N.
Mooreal quipes Canada TI. Invention romagnetic tips for control to the properties of propectar adress humps and other invented to the open and the second of which would prevent the inserion or dawing of why through the table. The object is t provide a fooding armaters which mistigates a stationary position, without the table of the properties of the pro position within the bore of the traveling two-being tested under the action of magnetic forces until an observation is reached which results in the giving of a signal

W H Pan Kerr and J F Monron WS Hermi tage Ave Treaten N J - the Inventor relates to shade holders adapted for use with an ordinary to shade holders adapted for use with an ordinary incandences lamp socket. You begit to object is the provision of a holder having ar recent y utiliar in a sparsius in combination with a protector which sendrous the lamp socket hard rests on the shade holder in spaced relation thereto when by rain and dust see, prevented from out-ring the shade shiftment for space of provided for the decidation of the air through the space is provided for the decidation of the air through the spacetrues of the

CHICKEN IROUDER - R R MURRAY
Millord Texas This invention relates to positive
raising and has particular reference to the care
of young chicks Among the objects to provide
a brooder adapted es secially for outdoor use or



THANKYERS SECTION OF THE DEVICE independently of a positive, house The dottee comprises a hollow pyramidal thick support with a source of heat within the base depending fabric strips, a ceiling of open meet material and a suitable roof the products of combistion being conveyed outward through a fitt

Of General Interest

IOE MAKING APPARATUS—A M. Fow
tan 1800 Diamond Ave S. Fanadena Cal
The investion raises mere particularly to mean
to the containers whereby to actuate the fluid
cother containers whereby to actuate the fluid
cother containers whereby to actuate the fluid
contents of the and furing till reveiled powerstoo
in order that olear clean k; may be formed from
multitilled water the object 1 king the provision
of a simple arrangement with h sill avoid the
budge state-fluencest now in use requiring contents.

BAO FASTENER -- J W LAUPHANN 1730 N Monroe 8t Battimore Md The object of the invention is to provide mechanism in our meetion with bags in so truels connecting the ends of the frame that is on opposite sides of the lock catches arranged to be removed by pain nutcom outside the bax wherein means is provided for normally holding the catch in released position antil the parts of the frame are separated for the opening of the bag

opening of the bag

MOVINO PICTURE CAMERA 8 M

Lawren 1803 Vyse Are Brooklyn N Y A

specific object of the invention is the provision
of a morriag picture camera lawing means for
registering the opening of the shuller with the
leas, restorting the film from in line with in the leas
to an out of the way position in cooperative rejaction, with the leas whereby the camera can be
represented without emposing any portion of the film.

WIV at 1 who discharge of oil

SIII-11 PACK AING I I I DION 1540 Acollan Hall 11 W 4414 New York N Y Among
the principal objects which the investion has in
slow are to protect the rilling hand of ordinance,
should in stading haskings for use on sheds or
in view in different sizes to facilitate the exposure
of the hands and to shoop packing device which
may be used a number of times

I MEROIDERY FRAME --- C ONDERS 50 I MEROIDERY FRAME—I ONMARA SO
N Bertania Ave Honolulu Territory of Hawaii
I is invention relates parts ularly to an embrode
to frame having rollers to receive the fabric its frame having rollers to receive the fairle an important object is to provide a frame in which the effective size of the frame may be varied to accord with a larger or smaller plece of material to be worked. A more specified piece to provide a knock-down frame with ratchost and pawl can tred for the rollers in either adjustment of the frame.

I frame MIJIPINO IRECRIPIACLE—S SARMOY 10 Washington I lace New York N Y The object of the Investment is to provide a shipping receptacle more uspectably designed for containing haste to deader without dance of remaining on otherwise injuring the hate Austhor object us to permit of packing a large number of his into a hipping case of a comparatively small size and without four requiring individual packing of the hate

MILL CAN SAFETY DEVICE—G II V zer 667 49th St. Brooklyn A. Y. This invention relates to milk can covers and has for

to relations: the plaint and to prevent distortion or illuptions in damps eachier SEPARABLES BILLION A J. Lean. Care Strong I roducing Co 311 Fourth Ave. New York: N. The object of the Invention is to provide a sequential button arranged to pormit the manufacturer or use to conveniently fusion the nutriton members togotier on orthode leading robbst or other material or to disconnect the material or the material or the material or the disconnection of the material or the material or the material or the disconnection of the material or the mate

FASTFNER -- J V WOODWORTH 120 Broadmay New York N Y flis invention relates to map fasteners of the stud and apring member type its object is to provide a fastener arranged type its object is to provide a fusteener arranged to ossells present the stud title congacement with the spring member and provent as idential discongramment. Another object is to provide resilient relaining members capable of yleiding easily in one direct loss and to reservant the spring from thirding members capable of yleiding easily in one direct loss and to reservant the spring from thirding nearly in an opposite direction thus ground the study of th

requiring emuddenable force to disnagange the state FOI DING WING GUIARE A. F BAILTY IS WAR'D AVEN THEIRD N. J. This invention tractions particularly to a folding chair or cut reactioning or any intermediate state being adapted to be folded into very small appear for storage purposes and one white is designed with measure to the folder of the company of the con-traction of the contract of the con-traction of the con-tra

## Bardware and Tools

ANIMAL SHEARS,—E S BARTLETT, Ha., Box 1439 Butte, Most. The invention had be its object to provide mechanism for omnesting the shears with the operating mechanism, and by connecting the operating fork with the blads.

The present invention is an improvement give
Patent No 1 299 579 granted to the same inventor.

cusions having a removable cover held in place by relates to name for postunation lives, and increase, and provided as it is other end with a hood or dome protein in which is because the state of the contract of the contra

JOINIER GUARD — J A DENOON 677 Masten Ht Buffalo N Y The invention has for its object to provide a device of the character specified for guarding the custing blades of a



operato The guard can be installed on any machine and does not need changing for different stock Matrial from one to three inches may be joint 1 without raising the guard When it is desired to sharpen the knives the guard may be swung to one side

SAW HANDLE ( S B HERRY South Bend West The invention relator generally to saw 1 indies and more particularly to a saw handle 1 r double and cross tutting saws capable hands I r double the cream cutting asset capanie of real: m | uick attachment and detachment the of | v | ising to provide a construction of the asveral parts whereby the connection may be rigidly: unished at all times

### Machines and Mechanical De

MACHINE FOR MEASURING AND WIND-MAY HINE FOR MEASURING AND WINDLive, Wall PAPER IN COMMERCIAL
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MILLS (AN POWER PARTY NEW 
Musical Devices

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## Railways and Their Acce

Railways and Their Assessments
DRIFING VALVE DEVICE FOR LOCUMOTIVES—I M Lickest 1800 Pearse Ave
hast Claviand O The object of the investion
is to provide a means of supplying naturated
neam from the boiler of the incomplete include
to the cam clinest when the said they the relocated
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and it less model we morning white by the momentum or down grade. To accomplish this
result use is made of a dirfting valve connected
valid this account rheats and the bodier to supply
provided with an automorals, share of to color to get
the steam in the steam chest reaches a predefermined promuse. mined promure

### Pertaining to Vehicles

TIRE GAGE —H McN SEWAR, care Geo.
Diokel & Co., Leutsyste, Ep. This invention



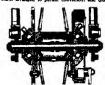
OUT MRI BANISM

mobile engine which is operatively combined with monic engine which is operatively commined with the throttle valve operating mechanism in such a manner that upon closing the throttle the ignificon dreut is automatically broker rendering the engine dead and causing it to run against the compression in the cylinders thus providing an affective brake

an affective brake

ACK—II D. Ray Island, of Ravinous,
ACK—II D. Ray Island, of Ravinous,
Cook Islands New Ecaland. The invention relates to jackes of the active operated type wheath
pairs of tought lewes are provided lawing at one
end a bean and at the other end a head for enpairing the object to be litted, the acrew having
threaded emeapment with one pair of the levers,
and a rotatable engagement with the other at
the connection of the members of the pairs for
moving the connections toward and from each
other when the other as returned to the connection of the connection of the pairs for
moving the connections coward and from each
other when the other as returned.

DEMOUNTABLE AND INTERCHANGE-ABLE WHEEL FOR MOTOR CYCLES—D L HICKS Hicksville, L I N 1 The object of the invention is to provide an interchangeable



removal of the rese exection wheel for rep other purposes without disturbing the messac or the brude insohanism. Another is to permit of interchanging the rear to wheel of the motor cycle for the brunt or a wheel of the motor cycle for the brunt or a wheel whenever destred.

DESIGN FOR A SHOE RETAINED. DESIGN FOR A SMOKER & CUTDOOR LIGHTING DEVICE—J B BARRE, MO

We wish to only acqueites he like that this we are in a position to reader conjustest services in every beauth of passets or condo-mark work. Our staff is composed of inschanical electricit sind and presente all potents applications, freeze of the complex nature of the antiper-marks volved, or of the specialistic polythic, or of the specialistic, polythic or of the specialistic, polythic or of the specialistic, polythical or of the knowledge required (therefore. We also have superiors throughout the who naster in the presentation of patent and a mark applications that it all countries fields the United States.

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# Many a Man Thinks His Full Duty Done When He Takes Out Fire Insurance

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Hartford, Conn







# Receiving Witeless Man Paper Ribbon

(Continued from page 448)

speed messages are secret messages to all who are not equipped with this device, A commercial phase of the speed ques-tion is peculiarly linked up with the st-A commercial phase of the speed quasi-tors as peculiarly halced up with the st-ino-pheric electricity phoromena of the north temperate some. For years it has bee found that the hest time for trans-nating all wireless message between America and Europe in from 4 A. M. to 16 A. M. Speedy-sending and receiving two condense the traffic into this most tha rable priced or a greater volume can be as it with a minimum number of sta-cial valley and the remembered that a pair of the control of the control of the con-trol When the in remembered that a pair that with a minimum number of sta-cial valley of the control of the star of the size of the control of the con-trol of the con

av 140 reoption up to the time has been 24 to 20 words per muster-or roughly 1100 words per hour I is has been a race to the contract of the contract of the contract to act units and receiving present in the contract of the contract of the contract one could receive But Mr Horiza am intoo has reversed the situation, with ar 1 viring instrument that records even fast! this a transmitter can be operated for the contract of the contract of the contract fast in this a transmitter can be operated fast! this a transmitter can be operated fast of the contract of the contract fast of the contract of the contract fast of the

da ly operation at Bar Harbor, Me, fo

the machanian of the new recorder is the machinem of the new recorder is but I in a comparatively simple principle ki wn to all electrocians. A light-weight murr r flutters in electro-magnetic tune will the munte electric impulses coming for the receiving antenna. The duration will the immute electric impulses common for it the receiving antenne. The duration and extent of the nurror seedlishions very at ring to the old dash, or selence of the aming station. From mirror reflects all un of light on to the moving sensitived [18]. This tape propelled by an electron of the receiving the propelled by an electron in 1 programs up and down through vertical pipes which contain the developing and fusion is function. vertical pipes when contain too developing and fixing themicals. Automatically, the tai pisses through the developing solution and then the hypo fixing bath, after which and power enrowment one oversopping sections and it in the hypo hange bath, after which it we said off memory water and them it we had been to be a superior of the power of t

The contract can be recorded without he provided without he provided without he provided without a last last two almitteneous assessments in additional sources were consistent on terraing circuit connected to the name of the sources was consistent to the contract of the

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device, explaining its operation.

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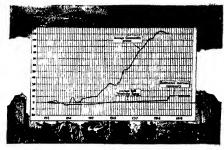
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# A Comparison of Costs

A graphic picture of the high cost of doing business is shown by the rise in a long list of commodity prices during the past five strenuous years.

By the exercise of unparalleled economies, telephone rates have been kept almost unchanged.

The fact is, the increase in the cost of commodities has resulted in what is equal to a decrease in telephone rates. In other words: The dollar which was spent for the telephone has bought more than twice as much as the dollar spent for the commodity.

The activities of reconstruction which are now upon the nation have put a great burden upon the telephone. This condition has made necessary an advance in telephone rates.

This advance does not excoed an average of eight percent; almost negligible as compared with the advances in other lines of industry, yet enough to cover the increase in the cost of operation.

Only through adequate revenue can there be assured the maintenance of a high standard of telephone service.



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Universal Service



# Receiving Wireless Mon Paper Wibbon

(Constraint from page 888)

In the no distant future Mr. Hoxie tape in the no distant return art, more predicts a wireless station equipped with a mide aerial but with several photographie recorders, each tuned to some long-distance station. Thus as the messages are recorder from the various stations, each recorder

# Invention as the Foundation of the Nation's Wealth

(Continued from page \$25) Depotle, first trolley car, Lay, dirigible torpedo boat, Brush, are light, and Howe,

sewing machine
( harts showed the growth of the patent work in the United States It is very interesting to fine that not used now we pass 10,000 patents per year (now we resus almost 50,000 yearly). The automatic telephone exhibit and the coal-tar saces were shown as examples of industries which exist literally on a foundation of patents—the one with 1,068 different jutents, the other with 2,492.

As an education in patentia the exhibition was an emphatic success. Many curiosities were exhibited, such as a patent signed by I homas Jafferson, also the only patent saved from the patent office fire of 1836 to one I Studies for of 1836 to one J Snyder, for a stove, and many quaint colored drawings of early

There has been from time to time a There has been from time to time a movement to establish at the Nation's (apitt) a permanent establish which shall, be both of the work of such state, maken be not been such as the property of the such shall be the property of the such shall be such as the property of the such shall be such as the property a validor might spend a year in the Capital and never have any one one property of the work, for instance of the Interno Department, just as not once in a thousand who come to the Capital have any idea of the extens, value could be such as the property of the such shall be such that the property of the such shall be presented by the such shall b before the public could be continued to the great benefit of those who form and maintain the government. As far as the part in office exhibit is concerned it could only be regarded as a keen stimulant to innegnation to invention, and to ambition to invent and patent. Inamuch as prac-tically all our national wealth which is not founded upon natural resources comes from industry reared on patents as foundamined and reaped largely by instrumentalia stimulation, governmentally maintained, would certainly be much in line with the government a idea of using its facilities for popular education Incidentally it would help both patent office and inventors to a better understanding and therefore eloser COOPERATION

## The Locomotive of the Seas

(Continued from page 828) morite as gondy let down into place on the hull for an electromobile of 4,500 horse power, sufficient for a hull of 10,600 traw diadweight the lifting force called for is less than 350 tons, and the length of time required to release the hull from the generating unit is 10 minutes. The dock generating unit is 10 minutes are dependently a single man, and presents no technical difficulty of any

The inventors of the Suell system are princularly interested in the problem of ceal transport Before the war there were annually shipped from the Tyne to Lou lon some 900,000 tons of coal With the buell installation it would be sufficient the brief matiliation it would be sufficient for the traffic to have 24 bulls of 1,200 tone dondweight each, and 8 dectromobiles, with two small footing docks, one on the Type, and the other at Grayesand. The outmated benefits would be very large. The single circumstance of influencing the electromobile at Grayesand had lowing

three times that would justify

# ide By-Products from Gald Dredging

(Continued from page 621) and before long they had demonstrate the availability of their material for most every thin of every in which create root is used. It went that the their continued the same of the following area, and from a same of the following area, and from a same of the same of the following area, and from a same of the same of the following area, and from a same of the same of the following area, and from a same of the same of the following area, and from a same of the same of the following area. years it is still one or non-most sind; reads in California. Teday, the tw warn out from two to three shoun of crushed rock a day, and this; ranging in size from coarse dust; weighing several pounds such, it as one end of the themseusto Valle.

one end of the theorements Vallay other, and hundreds of men are un in the ty-product fadanty resulting and dredging operations. In handling the dredge testings In handling the dradge tellings at root crushing plants, the most someon methods are used, and a network of patier advances are loaded into duit care by steam shovels, and as the mate is excerned at the land is left smooth aware and with second and left smooth aware and with second left. even, and with as much small sed were se much small make and soil on the surface as possible; it then it developed not only that a value product could be made from the dre tailings, but that, after the larger sto and boulders were removed and the s tailings, but that, after the larger stomes and boulders were removed and the surface leveled, fruit trees and excellysts could be made to thirty. thereon. The deep plowing to which the land had been subjected by the dradging process mushled the roots of trees to pensionate to the wrater level beneath AF Folcon: an experimental plantation of entallypte and olives was started, and from the was started, and from the very first it met was started, and from the very most with success, demonstrating that, under cortain favorable conditions dredged-over the radiatined for horizoultural certain inversions conditions dredged-outlined san be reclaimed for horticultus purposes. Similar results were obtains at Oroville, and some of the finest frugrown in that vianity now some from with the conditions of the same of the finest frugrown in that vianity now some from with the conditions of the conditions o

grown in that vicinity new output.

are termed "rock pile orchards."

Encouraged by their efforts to rettle isands, the dredge operators next to their attention to devising a dredge of their attention to devising the dredge operators are the rettlement of their attention to devising their attention to the rettlement of their attention to devising a dredge of their attention to devision and devision to devision attention to devision attention to devision attention to devision atte trear attention to devising a dred, would automatibally separate the classes of material passing throug-dredge, and dump the heavier stones bottom, with the floor material and the top, so that it would be poss-leave the land enturble for raising

the sop, so leave the land estable for raise. On some of the areas typical of number of stackets were installed number of a number of meving it the use of a number of meving it rumber of steaken were installed, it the use of a number of meving be material passing through the dress material passing through the dress takings will be presented and sarried takings will be the state of the state These are so arranged their they lowered or mand, or moved from side at will, thus enabling the character to deposit the various after material as he desires Even will material as he desires Even will incline values, transact of helice; is licen values, transact of helice; is pipes to the state of the state



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# Valuable By-Products from Gold Dredging

sued from page 640) poured over the stones so that the mud and fine particles of soil may find lodg-ment on top and be saved

While it is not expected that even a large proportion of the dredging lands of Cali forms can be reclaimed by the processes been described yet the success so far met with and the efforts being made by the with and the efforts being made by the dredge men themselves anounts us to being we that as uses can be found for the lands thus mixed, the means for rendering them is anishe for use will be forthcoming. Uniquestimably the larger proportion of the interest of the second of the second of the second of the use of the useful purpose. At the same turne, the development of the process of dredging whereby the land can be plowed up and the gold recovered, without scroundy interfering with its pranasses whose for greating or coop promps fitled be discovered in the future, they can be developed even though the surface can be developed even though the surface can be developed even though the surface. can be developed even though the surface of the lands is valuable for other purposes As suitable dredging lands are worth from \$1 000 to \$20 000 an acre even the very finest farm and orchard lands could hnest farm and orenard lands could be bought at famey prices and dredged after which the areas could be turned back to their former owners and used again for their original purposes. The practical ensummation of this plan would entirely beautiful the process. r move all hostile public sentiment against the deedging industry on the ground that it destroys the land This is a condition levoutly desired by every dredge op in this country

## The United States Patent Office By Edward Thomas

MAN's people will be surprised to hear the United States Patent Office ill dan advertising agent still it is not only that but an employment agency as will. The Patent Office does its advertisng largely by publishing the names of inventors and this publishing is done every a ck. I ach I ucaday noon the Patent Office mails to inventors or their attorneys and at the same time it mails several th usand copies of the Patent Office Official Cazette which contains an index to all the inventions patented and published that week besides the names of the anventors and a brief summary of some features of the inventions. Some of these putents together with the names of their inventors are soon buried in obscurity, but by no means all of them and probably only small friction of them for each week the Put at Office Cazette goes into the offices of hindreds and perhaps thousands of manufacturing firms and is there scanned regally for the inventive news of the hun heds of patent attorneys who are on the utlook for any bit of inventive information which may interest their clients in such information is passed along to th m unufacturer or promoter whom the patent ttorney thinks will be interested in it and with that information goes the name of the inventor whose ability is thus ad-vertised to the parties interested in his invention

invention

For example one inventor designed an admirable apring motor for a certain ma him. A maker of another kind of machine and the motor published in the Official Gasette, write to the inventor describing his needs, and asked the inventor what he could do in the local countries. that line The inventor not only solved the problem but today is getting a reyalty on the patent which solved the problem Meantime another of his inventions was another harse manufacturer in another line, and obtained for him a good noution as a professional inventor for that position as a professional inventor for the manufacturer. If it were not for the fac-that most inventers put a very examplerate estimate on the value of their inventions



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many more inventors would be agreeably suggested each week by inquires about shift inventions and by receiving offers of new jebs,
Unfortunately many inventors find it

Uncorrelated many investors and it difficult or impossible to work for either people because if they have not already in exaggerated idea of their own importance they soon acquire such an idea Many employers therefore hesitate to approach an inventor directly with view to hiring him but use indirect methe of approach But the manufacturer or promoter depends on the latent Office for promoter depends on the latent United for sorting out the really bright men from the erdinary run of people for getting hold of the really bright men who will give him of the really bright men who will give his something that will soom new and useful to produce or that will can be higs to broaden the scope of utility of his produces. In this way employees of factores, loosted remote from towns are brought in sonsh with other manufacturers especially with manufacturers who furnish the supplies the machinery and the tools which they see in their round of daily work. The men in remote factories who have valuable ideas are often foremen or workers at the machines and it is an order of the same are able to come in touch with the machine ery builders in distant etites.

ery builders in distant entres. Not only is the Patent Office an adjretfising agent or employment agency bits it also furnishes unrequiently recommended tions of the help on its advertising list. It does the because the Emmissers of the Patent Office pass upon every applimation for a patent and determine whether the ideas have sufficient novelty to entitle the applicant to a patent. Thus every preprint and applicant to a patent. Thus every preprint who gets a patent that to run a serfain mental gauntlet and the abdity to pass that gauntlet is no small recommendation of mental ability or at least of originality. that gaunties is no small recommensured.

of mental ability or at least of originality. The publishing of the patented application apreads this recommendation far and wide through the Official Gasette which, see stated above, is published each week Besides the names of the inventors, the pessives the name of the investory, tag Gassite contains a partial picture of sash invention and a rough abstract of the scope of the invention. Thus, the recom-mendations of the Patent Office are not more statements that the person who gets more statements that the person who gate a patient does assistantory work, since besides that implied compliment, the Petent Office picture is a speciame of the man swork, so that any one can judge of the character of the work. Further say one who wishes to know more about the details of a give nureation can buy a copy of the whole potent for five centa by sending to the Patent Office of the Patent Office

to the Patent Office
Of course some people will object to my
calling patents recommendations," because of a widespread class that many
patents are useless. It will have to be
admitted however that most of they recommendations submitted in answer to
hely mandet advertisements are useless,
for few persons will hire help to a twitten
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This "recommendation functions of the Tripled Stories Patent Office is employ more religiable in helping the progress of, our first of the tripled stories and the progress of, our first of the patent of the progress of the country of the progress of the progress of the country of the progress of the pr



## Why we emphasize popular price in this roofing label

BECAUSE heretofore quality alone has been the standard by which Johns Manville Roofings could be judged in relation to ordinary roofings

Price or first cost has been the one factor on which cheaper roofings could rely and undoubtedly thousands of buyers have denied themselves the splendid durability of a Johns-Manville Asbestos Roofing because of its apparent expensiveness

For years Johns Manville has been working to produce an Asbestos roll roofing that would provide the weatherproof fire retardent qualities that Asbestos alone can give at a price that would meet the widest popular demand. The result is

A Johns-Manville roofing of Asbestos rock fibre waterproofed with natural asphalts Being all mineral, it cannot not or disintegrate and therefore does not need painting or coatly refinishing

### Stone Roofe Den t Burn

No other ready roofing can give you the fire protection of Johns Manville Asbeston. Asbestone is the only low priced roofing that will stand the famous blow-torch test." This fact alone has placed Asbestoe Roofing on thousands of even temporary structures where fire meant big risk to production programs. Furthermore it does not dry out because the natural asphalts bound between the tas marris asparsis bound selvers me asbestes felts (insuring a permanently waterproof and flexible roofing) are sealed and shielded from the sun a best by the very insulating properties of the sabesigs felts themselves. In Asbestone roofing, the felts protect the water That is why Asbestone never needs coating or costly refinishing Add to this, its qualities of weatherproof per manent durability—and it is easy to see why Asbestone is fast becoming the most popular roofing in America

## Register Your Roof With Us

As with all other Johns Manville roof ings our responsibly does not end with the sale. The registration blank in every roll invi es you to record your roof w th us and means that the Johns-Manville registration assures you service promised

Write for our Asbestone booklet which tells real facts about ready

H W JOHNS MANVILLE CO New York City



OTHER JOHNS MANVILLE ROOF INGS Johns Manv le Standard and Co orb ende Arbestos Shingles. Johns Manv lle Arbestos Ready Roofing Johns Manvi le Bu t Up Accessos Roofing Johns Manville Corrugated Asbastes Roofings

Serves in Conservation





He Can't Get Them! POWERSTEEL AUTOWLOCK protects your cut and spare the against theeves. The combination of strong Yellow Strand Wire Rope and non pickable apring lock saves you 10% on their maturance in some companies. At dealers, \$2 35 east of Rockies. Basing Automint, also made of Yellow Strand Rope, is tow-home insurance. Has parented Snaffle Hooks. At dealers, \$5 80 east of Rockies Primargrams, The Cheline, is needed by every track-ow or Results seet of Rechine at \$11.10 with plain head y \$12.75 with 8 aft o Hooks BRODERICK & BASCOM ROPE COMPANY ST LOUIS of Colorated Tellery Strand Wire Bone Used at Land POWERSTEEL Autowlock doubsers who think that United States under obse-pations are of dubleus value because in government about had the hirfurgestent suits the As resulti-pations are held no good or not infrigated, in England Asynon who thinks a moment will perceive, April, 1918, that there are very leve peiseat leasuits was introdu in which each mad does not believe that arons the it has a chance of wirming, for what it the rood going of the constraint of the constraint of the rood going of the constraint of the constraint by the root of the constraint of the constraint of pair-ths of undoubled validity are seldom harden of undoubled validity are seldom harden of undoubled validity are seldom, health, one suct on, and for a smaller reason patents in Tables and nations of undesibled validity are seldom sured on, and for a smiller reason patents which are known to be no good are seldom defended. The reason why there are more patent state in America than in any other country is partly due to the small financial risk in bringing a Unified States suit, compared with as English suit, for example. In England the losing party has to pay the lawyers feet for both seldom darks to suit a large corporation unless suit of winning. In the United States, however the man who sues another cannot loss more than he is willing to pay his loss more than he is willing to pay his lawyer, so the American poor man has a somewhat better chance

One illustration will suffice to show the risk of bringing a suit in England The financial advisor to the owners of a valuable British patria, after they had used a certain infringer and won, advised them to give the infringer a home at a price angusted by the latter—a very high price it would seem today. The owners refused to do this and decided to stop the infringer. The infringer however, appealed and persuaded the fourt of Appeals that the patent was yould be events of the nates that the void like owners of the patent had to pay over to the infringers some \$200,000 for the expense of defending the suit Thus the patentee was not only without Thus the patentee was not only without he patent but so much the power for have g tried to enforce the validate of it. That could not happen in the United States. It Curmany, practically the only other large industrial country which has examine pass on all patents essend by it, the patents mainly appear in the names of the patents mainly appear in the first and the patents of the patents are not been after the during my years, so these concentrates are a bar to many German. cumstances are a bar to many German lawsuits on patents Besides this, in most many conservoss infringements of each others patents and they settle for relative durings; for cross cross licenses without lawruits

United States Patent Office and patent laws need improving, and there are several movements on foot to amend our patent laws to attain both these ends to be hoped that in amending the laws, Congress will carefully keep in mind the necessity of preserving the advertising value of the United States Patent Office, and will be careful not to reduce the already too few advantages the American inventor has m getting his ideas before a world is anxious to profit by every bright ides that can be successfully utilised

# Rabies and the Public Health

ROM lengland on April 24th, there oame to the American press sensational ports of an outbreak of rables, so wideagrowd that a condition akin to said west created Dealers in dog musies were evented believe in dog musies were swamped, and were accused of producering Dogs were stoned in the streets, and owners put their special pets to death by panile sprocesses. All this brings to misel were vividly Engiand's remarkable record were vividly Engiand's remarkable record was recorded to the second way of the second suggests some important conclusions with reference to public health, as a world problem England's remarkable showing is due to strict dog laws and their spioresment From 1887 to 1889, thous was an example of the second supported suppo spread that a condition skin to panic was

under observation for six metatha government. All stray dogs were As a result these her been no once of in England sines (900 paid she circle April, 1919. It is rusmoyed that the was introduced by was introduced by sole across the Channel in

the quarantine Pully to comprehend the importance of quarantine, as a protection to public health, one seeds only to receil the cause of rabines and its means of treasmission. A minute proteosom or one-celled animal, discovered by Negri la 1904, and assensed after him the Negri bodies, as the direct cause of the discovered by Negri la 1904, and assensed after him the Negri bodies, as the direct cause of the discovered by Negri la 1904, and assensed time health of these Negri bodies is desceeded in the brain cord on a misrecoopue alies and stellaring its with a particular fluid, called the Gleenas stann. This stellar is taken by the Negri bodies and differentiates them clearly from the other brain time. Their presence in the brain or spinal cord dischindry determines the fact that the animal was a vettim of rabine one, at once, instead of the control of the new of the control of the vertime to begin for the results of the war has been that governments have taken up health activities on a scale never before attempted. The health of the combetor attempted. taken up health activities on a scale never before attempted The health of the community is no longer a question of the individual, but of the individual and has relation to his neighbor. The recent out-break of hydrophobia in England after break of hydrophobns in England after her long mmunity, should give pieuse to New York city with a dog population of 500,000 and less than 100,000 of thasis licensed In one year, 1914, moreover, there were ever \$,500 persone in New York city bitstan by dogs No after-war problem is more important than this one of public health and the rigid enforcement of quarantum, that proved se effective in protecting England against the dread disease of rables.

## Metal Strapping on Wooden Boxes

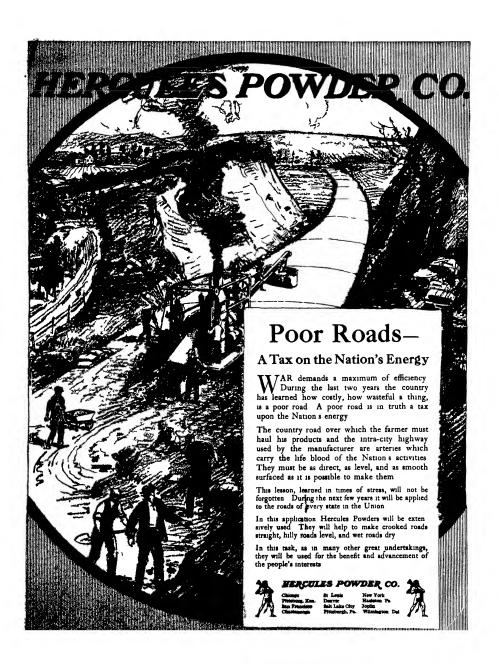
Metal Strapping on Wooden Boyces

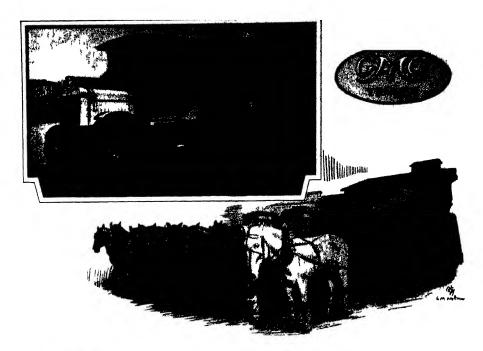
Onle of the quicket and chespects meshwooden box to vary it with thin, flat
metal straps. The shirty of a box to
withstand the hazards of transportation
may thus be increased several hundred
per cent lests made at the Forest
information as to how a box should be
strapped to add most to its durability.

The best bloses to annive the attention

The best place to apply the strap is apparently about a quaffer of the length of the box from the end. The strapping is preferably nalled at each edge of the box to the box to the box to the day of the box to the strapping drawn sung by special tools for that

crewn soug by special tools for that providing the strap in place works will on boxes made of fumber 1/4-inch or mote in thickness, but onnot be recovered by some or thinner material because the nat splits the board On this hours it is uncoassay to join the two ends of the strap (for which, purpose there are several devices), there is no the strap of the strap of the strap in the strap in the strap in the several purpose there are several devices, there is no the strap in the strap in the strap in the several properties of the sever

Depending on tendous slows to keep the strap in place is, however, open and one section of health of the strap in place is, however, open and one section of health of the strap is not set of the strap is no longer tight action not only reduces the effectiveness of the strap, but a shrinkage in moisture or the strap, but a shrinkage in moisture owners to fall off when the bowns we be considered to the strap with the strap we fall of when the bowns we have the strap with the strap with the strap was partled at each profession. The effect of shrinkage of the box is also refrom when the straps we gailed at each possible strap is thus dispulsion and the local strap is thus dispulsion and the local strap is thus dispulsion and the local strap is the strap and the strap in the strap in the strap is the strap in 






## For Example

Take rad ato construction as an example of GMC thoroughness. This vertical tube cont nous fin core is the most afficient known. It does not depend on solder fo assembly strength it is firmly boiled togethe. It ests on two brackets boiled to the chase a frame no springs o dash pots are used.

# 1 GMC; 1 Driver, Displace 16 Horses; 4 Drivers; 4 Wagons

One GMC and one driver are doing the work that 16 horses 4 drivers and 4 wagons used to do for the New Dells Lumber Company Eau Claire Wisconsin

Starting at 7 o clock in the morning this GMC truck makes 20 to 30 trips a day delivering green mill wood over town under all conditions of weather

It hauls 3½ tons at a load and is always on the job

Estimate the cost of feeding, stabling groom

ing and harnessing 18 horses. Figure the up-

Then figure the weges of four drivers and con sider the employment problem involved.

This is a typical example of GRC trieds willity Your business may be different, but among the GMC models, ranging from 1/2 ton to 5 tone, is one admirably fitted for your work.

Behind every GMC is the backing of the General Meters Truck Company and its policy of plain houset quality

Let your next truck be a GMC

# GENERAL MOTORS TRUCK COMPANY

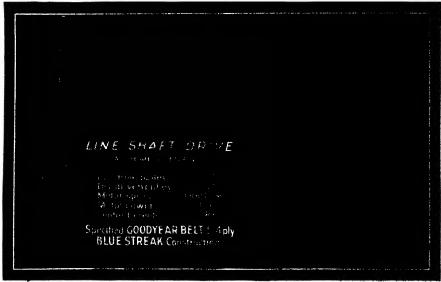
Pontiac, Michigan

Branches and Distributors in Principal Cities



# SCIENTIFIC AMERICAN

4 AUR 1919 



Consider 1967 by The Conduct The & Buther Co

# That Line-Shaft Drive, an Advertisement—and the G.T.M.

The A C Horn Company, Long Island City, N. Y., used to have much trouble with one of their line-shaft drives On it even the most expensive double bells wore out in ax months. Before they wore out they often alipped off the pulleys or broke leaving idle all the labor and machines depending on that line-shaft for power. The drive was costing a lot of money for belts and belt repairs and more in lost production. One day Mr. Horn saw an advertisement telling about what a G. T. M. Goodysear Technical Man had done in solving a difficult belting problem—reducing costs and increasing production.

He sent for a G. T. M Our Mr Miller came studied the drive measured pulleys horsepower speed and the like. He noted that the air was exceedingly dry and that there was a great amount of lime dust—which accounted in part for the rotting and wear of the belts previously used So he specified a Goodyear Belt of Blue Streak Construction—designed to operate under just such conditions—and an inch narrower than those formerly used

The price was much less than Mr Horn had expected—so much less that there was some doubt as to whether a belt of such

modest price could meet the exacting conditions. But one was ordered and installed

That 5-inch 4-ply Blue Stream has already given half agains as much service as the most espensive belt they had ever used Still more important at has done away with the delays and dimmahed production that used to be so common. And it leaks good for many more months of trouble-free services

After that the G. 7. M. mente a plant analysis, every drive in the plant and prescribing the proper hole for it. Five of the recommended belts have already been installed. Every one of them has proved to be a strong endorsoment for the value of the C. T. M. a service.

If you have a difficult drive that either devours tee many belies or interrupts production too often—or both—sale a G. T. M. we call He il do it without charge when next be so in your visibility. There are many of them—all trained in the Goodyser Technical School—all with experience in plants similar to yours—all trained to sell belts to meet conditions and not see a grossy cells sugar.

THE GOODYEAR TIRE & RUBBER COMPANY AKRON ONIO







# WHICH WAY?

A Short Cut for Purchasing Departments

Case 1. The purchasing Agent of a big company looked over his needs. In all, he wanted 13 distinct items. He sent out 13 separate orders to 13 different companies.

Note what happened: He received 13 acknowledgments. He followed up 13 companies for prompt deliveries. His Receiving Department reported 13 arrivals, checked 13 Bills of Lading and 13 invoices. The cashier made out 13 individual checks, to say nothing of the 13 envelopes the stenographer addressed and the 13 stamps.

13+13+13+13+13+13+13+13+13+13-Look at the cost in time and motion!

Case 2. Here is what is happening more and more in busy Purchasing Departments. Suppose 13 distinct items are wanted. It is frequently found that The Fairbanks Company can supply all these needs. One order is sent.

One acknowledgment is received. Generally the delivery is made in one complete shipment. One bill comes in. One entry is made on your books. One check is drawn.

Note the time and motion saved!

PURCHASING direct from The Fairbanks Company saves doubt as well as motion, "The Fairbanks Company O.K." is put on all articles sold by the Company. This O.K. means that the articles have been passed by The Fairbanks Company as O.K. in quality, O.K. in design, and O.K. in price.

"The Fairbanks Company O. K." is put on Mill, Mine and Railway Supplies, Valves, Engines and Pumps, Scales, Machine Tools, Power Transmission, and Trucks, and Wheelbarrows, and Automobile and Service Statton Equipment. It is backed by quality and service which have given The Fairbanks Company an international standing.

The more value you place on your time the quicker you will want to get in touch with the nearest Fairbanks Branch House.



THE
FAIRBANKS
COMPANY

Idministrative Offices.

Rran h H uses
kli inv New York
kli inver Paterion
katon Philadelphi
irmingham Providence
iridgeport Pittsburgh
buffalo Rochetter
chicago Scranton

V Orleans Washing
HAVANA, CUBA
LONDON, ENGLAND
BISMINGHAM, ENGLAND

# FAIRBANKS Company

O.K.

MACHINE TOOLS

TRUCES & WHEELBARROWS

VALVES P ENGINES & PUMPS

OWER TRANSMISSION

AUTOMOBILE AND SERVICE STATION EQUIPMENT

# "What is packing anyhow?"

Ox r salesmen frequently comment on how often their friends, outside the humans ask the question.... What is Packing?

Some of the toless as to the meaning of the word are very amusing in their requiress and it is very seldom that the accurage mean realizes find what a big part this product plays in the afficiency and connency of the industrial machiners that is making the world better for as all

So for all its seeming insignificance the story of what packing is would seem to be well worth telling and well worth reading by anyone

As a starter consider Packing as something like the "washer' in your kitchen faucet. It prevents leakage—or ought to

Now whenever steam is put to work—or water, gas, brine, or ammonia packing is needed. It is needed to prevent leakage where glearning rods alide smoothly in and out of cylinders, for leakage here means not only loss of steam or water but, actual waste of power.

And mastle the cylinders of pumps packing 's, un saves power With perhaps two h n ired pounds pressure on one side of the piston, and a vacuum on the other; ston packing prevents leakage past if the piston.

And sheet pa king cut or molded into gaskets, prevents leakage at joints of surfaces or 3 p n<sub>b</sub>

So, fundame tally, packing guards against leakage

But when it werks against moving surfaces, pach; re subject to west-roc it goes "de ! and loses its clustrating This means replacement, shut down machinery of expense. So the buyer of packim, must ask not only "Will it prevent te lage but also "How long will it lear which of course depends on the material and workmanship put into it.

And there a third question, which the engineer will ask if you don't "How

much riction does it cause? I For some packings prevent leakage merely by filling up the packing space as addity as possible. Naturally such packing bluds the moving rod—sometime even scores it—and acts more or less as a brake. It is such sertious fautte as this that Johns Marwille has overcome through intelligent packing designs

So packing is not a thing to be bought at random—the right choice will save money by preventing leakage, by conserving power, and by its longer life.

As the pioneers in packing development we have placed packing design on a scientific basis, and out of experience, observation and facts have established a complete and standardised line that meets every plant requirement from among the minimum number of packings. Only in this way can packing be made to give a maximum of services for media to give a maximum of services for

Here is a partial list of Johns Mannells Pacifyings. See Blings for outside pocked Rods. Service Sheet an all around the John thoset pacifying Universal Politon for inside packed pumps. Kennerge balls men and handlade gadekts; Mogell Cell Packing for color stems and small rods. Singulitis Sheet for pacific gells are seen and maghine.

H. W. JOHNS MANVILLE CO. New York City. 19 Factories -- Branches in 48 Langu Cities

Through—
Asbestos
and its allied products

INSULATION
that keeps to be their unders at be their
CEMENTS
that make builer stall; leak proof
ROOFINGS
that cut down for ruis
PACKINGS
that save proor waste
LININGS

PREVENTO

JOHNS — MANVILLE Serves in Conservation

# SEVENTY-FIFTH YEAR (COMMISSION)

## THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXX

NEW YORK, JUNE 21, 1919

7.00

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## Monetary Cost of the War

Monetary Cost of the War

If all the gold in the whole world were mitted
a up ratio builds and minsted into double eagles
distribution and minsted into double eagles
debt incurred by the United States in the great
debt incurred by the United States in the great
debt incurred by the United States in the great
than we did no prosecuting the war. It is difficult to form any conception of the enormous
sost of the war, but we have endeavored to give
some idea of it by a graphic comparison of the
Germany. It used to be that a million was
spoken of very gibbly and statisticians bewaied
form and the general public had no idea of it the
sax mere trifte and talk as gibbly about billions
It is impossible and at the same tune unnecesdular represented by our war debt. We cannot
rausaine a billion dollars in terms of dollars
dollars represented by our war debt. We cannot
rausaine a billion dollars in terms of dollars
of measure For instance it corn worm sold by
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and hereal we also also the size of the solutions of kernel we should have to talk of millions and
blices of kernel we chemical as small quantity

the kernel we should have to talk of millions and billions of kernels to represent a small quantity of oorn Instead of that we adopt a larger unit of measure namely, the bushel and so in dealing with war debts of the nations instead of trying to represent the vast sums of moncy in units of the size of a gold dollar we can conceive of the amount involved if we adopt a cubic foot

as the standard. Therefor, in the accompanying omparison we have illustrated the delts in solid cubes of gold measurable in cubic feet. Our figures are based on statistics prepared v Harvey I Tisk in his book entitled. Our I the Delt which was recently published by the Baul is lived Company. The statistics were compiled prior to the 15th of April but we lave all I the am unt of the Victory Loan were compiled proof to the 15th of April but we have all 1 the am unt of the Nitroy Loans a thet us figures lifter somewhat from those active 1.5 Milliarce 1 last. The date of the Litt 1 States before we intered the war was approximately one fallow of dalars. Now it is \$111 u.t. it 1, 80 billion dollars. In other than and 1 load until the matter of the matter of the source of the matter of the source of the source of the last of the source of the last of the

(Continued npg 66)



Treaco
nations involved in the war represented in a golden tower, compared with Trinity Church Steeple, New York;
also the per capita wealth, debt and interest on debt

## SCIENTIFIC AMERICAN

Published by Scientific American Publishing Co Founded 1845

New York, Saturday, June 21, 1919 Mann & Co 233 Breedway New York

Charles Allen M: 1 s let 1 (tra : 1) Muan Trea

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E Diederiche Prif of Japane, Communication of Tolland Energy B. Home, Pr. of Japane, Communication of Tolland Energy B. Home, Pr. of Japane, Communication of Tolland Energy B. Home, Pr. of Japane, Communication of Tolland Energy B. Japane, Communication of Tolland English Print of Conf. Department Conf. of Japane, J. Harth Print of Conf. Department Conf. of Japane, J. Japane, Communication Communication of Tolland, Editor of Conf. On Communication of Tolland, Conf. On Conf. of Conf. o

### Always On Its Toes

TOI infrequently in recording the progress and achievements of the Navy we have noted the fact that the Navy is always on its toes Notably was this the case in the matter of transatlantic flight No sounce was the armistice signed and the pressure of war servic removed, than our Naval Ar-Bervice bent steelf with redoubled energy to the task of praying that a scaplane could be built that would fly

That air-voyage from I ong Island to Plymouth by way of Newfoundland the Asores and Lishon will take high rank in the annuls of naval achievement and to the Navy will the nation is forever indebted for the dison which has come with the construction of NC-1 and the skillful pilotage of Commander Read

It was fitting that this distinction should go to th ountry which gave birth to the art of mechanical flight The Wright brothers found so little appreciation of their spech-making invention among the financiers of their own country that they had to go to Lurope before they could secure the necessary emouragement. We have changed all that, however and to the Navy belongs the credit for bringing to the native land of the airplane, the blue ribbon of the acreal seas

fore these lines are in print it is probable that two of the contestants for a straightnway flight from con-tment to continent will have made a successful landing in kurope or dropped into the sea. Both are military bombing hiplanes and both are driven by Rolls Royce engines. The NC-4 made her trip with Liberty motors, and so the contest will give a good line upon the two types of drive The Vimy bomber has two, the Hand-

ley-Page four engines Granted good weather and clear skies for navigation, and the question of winning ir losing is entirely one of the endurance of the Rolls Royci engine. We far as we know, it has never been put to a test approximating this one in severity

The N( 4 and thus Handley Page bomber are huge machines but the end in size and wrights is not yet. The Tayrant triplane built by the Royal Air Force with its weight of 22 tons its lifting surface of 4 950 square feet, and its six engines of J 000 combined home power is so much greater as to be in point of dimensions in a class by itself. This machine would not appear to be available for transatlantic flight, for with 10 000 pounds of oil, using all engines with full throttle the endurance at 11d miles per hour would be only 900 miles Using four engines and throtting down would enable the machine to cover 1,200 miles, which is about 750 miles machine was badly wrecked Necessarily, the superse will encounter its most serious problem in eatter of starting and landing

## Think Nationally

T was easy for us to understand why anything so radical as moving forward the hands of the clock should have been looked upon with suspicion by the conservative public before the experiment was made The idea seemed fantastic in the extreme But why should there be any opposition to the conservation of daylight now that the measure has been given a fair trial and has proved so popular through the country? This we fail to understand

It is true that daylight saving was adopted as a war measure to conserve fuel and as a war measure at paid no attention to public convenience or public prejudice When however we had experienced the blessings of an added hour of sunshine in the afternoon it seemed to us that the new summer time would be a permanent metitution On every hand we heard the measu commended, hence it was with a distinct shock of surprise that we learned of the rider placed on the Agricultural Appropriation Bill last winter For tunately it was a simple matter to dispose of the rider on a point of order and we had h ped that opposition to daylight saving had been d finitely and finally killed But the Committee of Interstate Commerce has repo a repealer as a separate measure and probably before this paper has been published the measure will have been considered and passed upon by the House

If not too late we wish t register a most vigorous protest against any attempt t repeal the daylight saving measure. We have trud to look upon the ire impartially and to weigh as carefully as possible all the arguments against it but we have been unable to find any ground for its repeal and we cann prehend the motives underlying the opposition to the measure Apparently the farmer finds daylight saving irksome, but he shows no disposition to adjust himself to new conditions He does n ! t ike the matter seriously but looks upon it as a new funded notion which is a bother to him and of no real I neft to the country at large. It seems strange in | I that the man wh day is long as that of the sun whi is out in the open from dawn to sunset, shoull d anything to prevent men who are couped up in city ff is and who have to tuil in factories, from sharing with him some of the benchts of cutdour exercise Why should the outdoor man want to keep the tist ir man in? The whole apposition seems to be due t a narrow point of view on the part of the farmer We would urge him to think nationally as Rosevell put if Any farminds d man who considers the measure broadly from all points of view cannot full t scales the immer advantages to the country at large of starting work earlier in the day and closing work earlier in the after-

I his country has always been very fair to the farme He has had practically ever thing he has asked for It in time he showed more considerati in for his city brothers, and we would also remind him that it is the ex farmerthe man who was brought up in the country and who loves the broad outdoors and who is now obliged to and has tune in the city—who is most enthusiastically in favor of "summer" time

### What Shall We Do with Our Shins?

HE shiphuiding program has been greatly reduord since the againg of the armistice the Shipping Board having suspended or cancelled ntracts for 754 ships, aggregating 2 532 000 gross tons contracts for 772 imps, aggregating a one a para-We have built and expect to build 2 444 vessels, aggr-gating 9 187 000 gross tone, the total cost of which will be 21861,755 570 The total sum authorsmed by Con-gress for new ships was 83,671 000,000 The Shipping Board asks for a further appropriation by Congress o m of \$673,868,301

What does the nation wish to do with these ships? It is with a view to getting an answer to this question that Mr Hurley has followed a policy of frank dis-closure and discussion. Through the press and on the platform he has made known the policy of the Shipping Board, and the country has been fully advised of the progress of our yards in turning out the ships Already we have a large fleet and it is growing by leaps and

The time has now come when Congress must mine what disposition shall be made of the first, and for Congress to act it must know what are the wishes of

the country in the matter of control and use Manifestly, the first question to be decided is whether this great fleet shall be owned and operated by the Governsent or whether the ships shall be sold outright in the open American market and be operated by the individ-

open American market and be operated by the shattvar-ula or shipping companies who purchase them. With a vasw to obtaining an answer to this question, that should be representative of those interests that are most immediately concerned, Mr. Hurley has appeared before the more important commercial bodies throughou the country and recently invited them to a meeting in the country and reconty invite taken to account when the way which years for a joint discussion. The gathering was widely representative, the delegates representing every the country and all the leading associations that are concerned in the expansion of our foreign trade that are concerned in the expansion of our loveing wave and commerce. The gathering include representatives of the Shipbuilding and Shipping interests, the Marine Insurance companies, the Chambers of Commerce of the leading titles, the Trade Streams and Councils, the Imerican Experiers Association, the American Federation of Labor, the Farmers National Council, the National Grange, and representatives of the leading

It is impossible to do more than outline the general trend of the many opinions offered but it was evi early in the discussion that there was a practically unanimous sentiment in favor of private as against Government ownership and operation What feeling there was in favor of Government control came from one or two representatives of labor and the agricultural interests. It was noticeable that not only did the speakers who have a working knowledge of the shipping business advocate private ownership and control, with kederal assistance until the new venture is firmly upon its feet but they insisted that, so far as operation was concerned, the purchasers of the ships should be allowed to operate them entirely free from Government rierence It will be remembered that the proposal of the Shipping Board called for provision for a general Board of Directors in Washington, which should include a Government representative sitting as member of each Board of Directors of the purchasing company

mourt or Laretters of the mosting that all the wooden ships should be sold in the world s markets, and that all steel ships of less than 6 000 tons should be disposed of, 5,000 tons being the smallest size that can be operated to advantage in the foreign trade. The speed should be not less than 12 knots, and higher than that for special routes notably those to the principal South American

It was urged that, if the merchant marine is to be a success, it must be popularised This can be done in two ways By a well-organised campaign of education and ways by a wide distribution of the ships around the whole coastline of the United States Each port in the country should form shipping companies for the purchase and operation of the vessels and an effort should be made operation of the version and an enter all the state of the get public money into the local shipping companies. The Shipping Board should see to it that the ships are well distributed and that they do not all go to a few of the leading porter a most important point if a wide national interest in the movement is to be secured Strong emphasis was laid upon the need for a broad

varying unipments was laid upon the need for a broad Federal Charter for the ships. No State should pass dibetembanical law. There must be one great National shipping, not a series of local and independent State offeris.

therto the indifference of the Middle West to the Hitherto the indifference of the Middle West to unsuppositing of the merchant merus has best the great stumbling block, but it is believed that the war has served to enlighten the farmer. He has leated how the served to enlighten the farmer. served to enhalten the farmer. He has leasted how greatly he was hampword by our own shorten of ships. The Prendent of the Kanses Agricultural College said that the farmers were already taking a breader view of the question, that they are not in favor of Government ownership, and that, if the true facts of the shipping situation as affecting their particular interests is con-ormed are made often to them, they will favor the granting of Government seaftance in the pioneer work of establishing our flag on the seven sees.

## To Our Subscribers

OUR subsettlors are requested to note the expiration date on separa of Sonswerre Assureant. If they will send in their renewal endows at least two weeks prior to the date of expiration, it will add us greatly in rendering them efficient service.

## Electricity

Iron Fipe as Conductor.—The 94,000 km. 68,000volt outdoor substation at Hog Island in one of the many substations built during the war in which tron-pipe conductors are used, states the Biostoical World. In that installation all primary conductors except those to transformer terminals were made of iron pipe. Other compands in different parts of the country used from pipes for high-tension bushars and for primary connectuous in substations. The parcelos has proved as satisfactory that many companies are continuing to use iron pipe for these purposes, though the war restrictions on the use of copper have been removed. The iron buses on outdoor substations are usually patvaniand.

Fires Due to Wiredess Waves.—At first thought it soems highly improbable that any fire could be searched to the effect of wiredess waves, though it is concervable that, granted certain specially favorable conditions, the indings of a spark between adjuvent metal parts might have such effect. M. Le Roy in a rocent issue of the Compite Rendess describes capturements intended to test this point. He had met with several cases in which fire did appear to have been caused by wireless waves. Accordingly, he constructed an "inflammable recentary by the aid of which he did succeed in setting fire to paper, ection wadding, and other substances. He thinks it possible that in certain condutions inflammable substances, such as bales of cotton bound with hosp iron, could be set on fire by wireless means.

Electrical Effects in Vibrating Wires.—A rocent communication to the Proceedage of the Rayal Scosety by Admiral Riv H. B. Jackton and Dr. J. B. Bryan zeles to the effect of the surface of vibrating wires on the electric currents penerated in them by the earthst magnetic field. Butting, for example, diminishes the current, but the decrease is not entirely due to smaller exitional area. Surh currents can be detected by search coils, and somewhat similar effects take place in tribrating plates. The effect is not produced in son-conductors, but it seems to be accepted by the authors that, after allowance for the effect of motion in the earth's field, there still remains an effect which cannot be accounted for. In any cass mach affect may be of appreciable consequence in telephone and other circuits in which intermittent currents are involved.

Shock-proof Tungsten Lamp. Despite the many improvements introduced in the manufacture of tangsten lamps, they have remained delicate until the present to be handled with extreme cere to swid parting and shattering the delicate Blament; but in more reachings the many that the the tangent lamp has come to be fairly ranged and available for almost all purposes save in mile, printing plants, and other places subject to intense pounding or shocks. It has remained for one of our leading electric lamp manufactures to introduce a new type of tungsten lamp which incorporates a shock-abording feature. The filament mounting, instead of forming an integral part of the glass stem as is usually the case, is spring supported. This feature makes this lamp serviceable and preferable under almost all conditions where earthen lamps have been used hereofore.

Bubatitutes for Rubber-Insulated Wires. —In a recent issue of a German periodical there is an interesting dismusion concerning tests made in various "war wires," particularly in respect of mechanical strength and resistance to moisture and heat. The insulation on the wires investigated consistent of responsibilities of the property 
## Astronomy

Four Fertadic Comets, all of short period (615 to 8 years), are due to return this year. This following approximate dates of parthallon passage are given in the Observatory: Connet Finlay, October 6th; comet knoff (1000 IV), Reptember 2d; comet Holmes, December 1st; comet Schaumasse (1011 V). December 1oth These comet Schaumasse (1011 V). December 1oth These dates may be considerably in error, as allowance has not been made for parturbations.

The Astronomical Day.—The movement in behalf of making the astronomical day beyon at madmith; as as to eclaride with the civil day, has borne fruit in Great Bertam, where the Admiralty has just given metru-times to have thus reform adopted in the Brutah Nautural Almanae, beginning with the sense for 1926. This step-was taken after consultation with the Ravaja Astronomical Nociety, which, in turn, consulted the supermittedents of the sphemerates issued in other countries and vasious other astronomical authorities. According to Nature the change is made makinly for the benefit of seames

The Weather Data Needed by Eclipse Expeditions. In connection with the coming solar selipse of September 10th, 1925, the path of totality of which ero Maxico, Prof. W. W. Campbell renews a suggestion which has been made by Professor Todd and other astronomers; vis., that weather observations should be nade along the prospective shadow path for a few years before a total eclipse, not only at the season of the ye in which the eclipse is to occur but also at the hour of the celipse. The observations made at the regular termhours at meteorological stations often give an entirely erroneous idea of the kind of weather likely to be encountered at the time of an eclipse Professor Campbell says that the data supplied to prospertive observers of the Russian sciepes of August 21st 1914, were based on cheervations made in the morning and evening, and gave fair promise of clear skies for the event After the eclipse parties reached Russia they were surpresed to discothat while clear weather was the rule in the evenings and mornings and at night, cloudiness generally prevalled in the middle of the day, reaching its maximum at about the eclipse hour. The lack Observatory would not have sent an eclipse expedition to Russia if this con-dition had been known. In connection with the Amerian eclipse of June 8th, 1918, the data prepared by the Weather Bureau based on morning and evening observations, gave no token of the fact that in certain localities essected by eslipse parties very troublesome high winds normally prevailed during the period of the day in which the eclipse occurred. Those winds gave res to distressing dust storms.

Dark Markings in the Sky .-- Professor Barnard's descriptions and discussions of the numerous dark markings in the sky—possibly non-luminous nebula have already been mentioned in our columns. In a recent number of the Astrophysical Journal he again takes up this interesting subject, and gives a catalo of 182 of the markings in question. He believes that some dark places seen in celestial photographs are actual some care place when are unquestionably due to intervening opaque masses. Whether these masses are gaseous or non-gaseous remains problematical They are not confined to the region of the Milky Way. Thuse which cour in that region are not necessarily devoid of saity, for they may appear black by contrast with ight background. Elseutere, however, there are the bright background. numerous examples which are perhaps entirely dark. Their visibility leads Professor Barnard to suggest the "space itself is probably filled with a feeble light who forms a slightly luminous background for these day. bodies." Two regions of the sky visible from a intitudes are especially rich in dark markings, vis , 1) the region immediately north of Theta Ophiuchi, and (2) the region of the great star-cloud in Soutum near the cluster Mil. Some of those found in the first-name region are so strange in their shapes that it would be difficult to match them with similar forms among the luminous nebule. Professor Baraard recalls the fact that as long ago as 1894 the late A. C. Maynard, then editor of Knowledge, in discussing one of Barnard's hotographs, declared that certain dark vacant areas m to be undoubtedly dark structures or obscuring "seem to be unacupusly cark structures we obscuring masses in space, which rut out the light from the ne-bulous or stellar segion behind them." It would be interesting to know whether any carlier suggestions were made to this effect by astronomers.

## Aeronautical

New Altitude Record. -On May 28th last, Adjutant Casale, a Franch systata, in a fight for altitode accorded 31,000 feet. This remaitation a would's record, being 500 feet better than the flight of Capt. Lang of the British army whom January last user-add to 30,500 feet.

Long-Distance Photiess Plight. For some time experiments have been carried out in various countries with the object of controlling air raft from the ground, and according to the Journal a French machine successful and prescribed countries with certain specified defours—in covering a distance of 150 kilometers (about 10 miles), and in landing, when required, in a certain surdrome. A similar machine has been developed in the United States which, according to a recent statement of Secretary of War Baker, can travel without a pilot some 100 miles and land close to a designated post.

Argantina's Aviation Instructors.—Argantina has awatered for worn, and does not new doubter instructors from the United States. Some Argantina officers are now abrund studying avation in preparation for returning to their own equatry to act as instructors in military aviation. This advice has boar reported to the Secretary of State by the American Consul General at Banesa Aires, in response to a request from the Argantine Minister of War. During the past two months American avators have been offering them reviewes to 'transition are prospective instructors in flying, but found that they were not needed.

The French Safety and Comfort Competition.— The provisional list of stages to be followed in the Relode Parts tour of France competition, to take place in the early autumn, has now been mapped out. Machinaswill start from Pars, and will be obliged to stop at Tours, Nantes, La Rebelle, Bordeaux, Barriti, Toulouse, Barcelona, Nimes, Antibes, Turns, Frojus, Avignea, London and Islie, ending the journey in Paris. Two of these stages may be flown in one day. The total distance to be covered will be more than 2,700 miles, and the prizes will aggregats some \$60,000 00

The Peace Treaty and German Aviation.-In lancing over the official summary of the PesceTreaty, one finds the following rulings with regard to German acrial activities. The air clauses provide that the armed forces of Germany must not include any unitary or naval sir forces (lermany 14, however, to be allowed to intain a maximum of 100 unarmed scaplanes up to October 1st, 1919, to be exclusively employed in sea mg for subnuring name. The entire personnel of the air forces in Germany is to be demobilized within two mouths, except for a total of 1,000 men, including officers, which may be retained up to October. The aircraft of the Albed and Associated Powers are to enjoy full liberty of passage and landing over and in the territory and territorial waters of Germany until January let, 1923, unless prior to that date Germany is admitted to the League of Nations or is permitted to adhere to the International Air Cunvention The manufacture of aircraft and ports of aircraft is forbadden throughout Germany for un mouths. All imbiary and naval aireraft (including dirigibles) and acronautical material are to be delivered to the Albed and Associated Governments within three months, except for the 100 sexplanes already specified General articles provide for the modification of German laws in conformity with the receding clauses. All the clauses contained in the Treaty are to be executed by Gormany under the control
of the inter-Allied Commissions, to be specially appointed by the Allied and Associated Covernments for which the German Government is bound to furnish all noce facilities and expenses of upkeep. The duties of the Military, Naval, and Aeronautical Commissions of Control are laid down in detail. Aircraft of the Allied and Associated Powers shall have full liberty of passage and landing over and to German territory, equal treatment with German planes as to use of German aird and with most-favored-natura planes as to internal commercial traffic in Germany Germany agrees to scoupt Allied certificates of nationality, airworthiness, mpotency and beenses, and to apply the convention valutive to Aerial Navigation concluded between the Allied and Associated Powers to her own sireraft over her own territory. These rules apply until 1923, unless Germany has previously been admitted to the League of Nations or to the above convention.

# Steel Wheels by a New Process

# A Combination of Rolling and Forging that Gives Good Results

By E. F. Cone

A ROLLI D steel wheel is now being made in a large western Pensylvania steel mill by a method and apparatus radial ill different from sarylang herestore. It re called a rolling forging process. About 15 years sold side of rolling which were made in the United Busies from a flat steel side. Yuch a blank was pumphed tast presend into shape a flat sylundread form a fundamental form and the United Busies insuited in a rolling mill. This procedure was an adaptation of continuous Lucapean types of rolled whost

PAY

projects one die towards it iompanion die and an elestric motor which san di vilop from 1,000 to 2,000 horre-power or thereshows the periodist on the san and assount of work to be done on the blank, is provided for rotating one of the angularly disposed dies which by fretton also rotates the companion. It which which is almost the companion of the san and the san the san and sanuses the reverse form of the done at he presente and essuarse the reverse form of the done at he presente and rotation continue. A little to the done of the san and rotation continue.

nue A thrust of 3,000,000 pounds or more is taken up by thrust bear-ings which are behaved to be the largest in the world. This method has the idvantage of rolling the steel has the advantage of rolling ton most under cumulative pressure thus working every portion of the blank into a whill or other annular shape. The time required to roll a blank ans sime required to roll a blank into a wheel varies from 20 seconds for the smaller sizes to about one minute for the larger sizes.

There is provided in the blank a shall a such a second size of the size of

There is provided in the blank a slight ansetut of excess material, which is solid out in the edge in the form of a fin When the rolling is completed, the whoel is withdrawn from the mill and placed in a fin sharing machine.

In the operation of this shear, a har, which is preferably epinedronal in shape, is deposited on the skide and rolled into the space bounded by the side guides. Here it rests upon the long supporting roller, which is then postavely rotated by the electron motor and connections in the direction of the rotateous of the hear when being set. The pusher them moves the her forward until its east rosts against the holder adjacent to the shear knives. The shear heads or dates are them rotated in a counter-to-clockwise discretion. As the shafes rotate channel facility of the state for the damastrically may be a shear than the state to the state that the state that the state that the shear is the section, the shear hardes of each state that the state of each state that the state of each state that the state of each state of the state of the shear fairties and the friends divines action of the supporting roller, which is positively drives, as mentioned. One of the unusual products is a rolled double-flange 3d-lind crash wheel. It is first rolled in the wheel mill with a flat tread and this them introduced into another special tread-rolling mill in which the tread and this freedore, wheels of the land have head their treads machined of the marked who are the state page. This automatically pides up the finished whose as they come from the machines.

Box Handles of Wobling to Save Shipping Space
IN suport shapment, house loaded with 200 to 200
pounds are incet easily manipulated when provided with
handles. Unaulty such box handles are made of crops,
unserted through holes in the ends of the heart of the
second with wall knots the ends of the heart of
on the under set held in place by mails or servers
here the brought the classe.

The former method of fastening has the diadvantage of taking up valuable space in the
interior of the box The latter increases the
thankness of the clean to provide for a groove
of sufficient depth to hold the rope, thereby



of tread rolls

The new process begins with a standard-uses impoland rolls in an large to-chigh mill, thus producing a
scalar rolls in an large to-chigh mill, thus producing a
crimitrous in from 11 inches to 20 mobis in diamstandard of time 1 for 10 inches to 20 mobis in diamstandard of time 1 for 10 inches to 20 mobis in diamstandard of time 1 for 10 inches in product of 1 from this large bety means of a rolary
shear mto which the hot-rolled cylindrad bar is introduct of 1 for alores thus out our stifer another from
the mod of time bar produce blanks of any suse or weight,
dappied to be finished into a wheel or gene blank
Those blanks have an outer cylindrical surface of
the steel arranged in radial relation. The rolary shear
takes the place of older methods such as using fast slabblanks, short ingots or longer mgots cut into blanks in a
lable.

These blanks are heated in a heating furnace as These blanks are neared for the high carbon stel used in gradually as necessary for the high carbon stel used in making the wheels Hetwen the furiace and the whol-mill proper as a presumagn machine which properts a short steel punch or mandrel part way into the center of the blank, making a cylindroal opening in the centre thereof. As this hind, is introduced into the wheel mill street. As that blank a mirreduced into the wheel mill alone up one manded with its previously placed in position in pregented into the operating and as the wheel in pressed and fould in the whot mill the manner! sold to be blank centrally in position and at the same time many portion of the length of the bors of the wheel ready not the milling and until the blank has been withdrawn from the mill milling and until the blank has been withdrawn from the milling and until the blank has been withdrawn from the milling and until the blank has been withdrawn from the milling and until the blank has been withdrawn from the milling and until the blank has been withdrawn from the milling and until the blank has been withdrawn from the milling and until the blank has been withdrawn from the milling and the wheel of the milling and the wind the milling the milling that the milling and the milling that the

the other die A hydraulic plunger of emirmous size

The forming dies clealing in upon the blank

rotary shears and the mandrel is pushed out and the punching of the hore finished as shown in the puture

hore finashed as shows in the peture on page 551. In addition to reling freight, passenger, electric and other car wheels, this mill is also particularly daspied to reling gear blanks and automobile flywheels and in espe-nally useful in producing solid tellid wheel canters such as have been used in forces countries for many vacan

whele casters ruch as have been used for gang countries for many years and to which separate sizes are fixed. The relaxy shaar as decayed to cut large bars quasily m order that all the blanks may be set from one bar before the next bar as delivered from the mill and also to set these while the bar as still just. Bash blank is set un about eight seconds. The length of the feed apparatus as about 60 set, and the length of the feed apparatus as about 11% feet in the length of the search and the set of the engage and the length of the search parameters about 11% feet long. The width of the shearing machine is about 15 feet over 11% the height 11 feet 5 noises above four-dation and the weight approximately \$40,000 pounds

The white-het blank in position between the eller which will green it into the wheel form.

## Motion-Picture Colony Under One Roof

THE motion-picture mdustry has grown so fast that it has burst its environment and spilled over into any place where room could be had As a result, the average motion-picture con-cern today has studies scat-tered through city suburbs and far out in the country wherever land and space sould be obtained. Thus one downtown, laboratories up-town, a workshop in the business district, a storehouse in the factory district, and a property room in any avail able spot Needless to say, this has been far removed from anything like efficiency

from anything like efficiency there has been a vart amount of lost time, wasted energy, accessive out in cartage, lighting, telephoning—in a word, a great waste of people and things. The perfecting of the motion-picture industry in a business sense, so that many perfected units may work together in full efficiency, as solut to be epitomized in the new building being serected in New York city by the well-known producer, William Fox It is probably the first time in motion-picture history that the

time in motion-picture history that the three leading branches of any producing organisation—studies, laboratory, and ad ministrative office—have been brought together under one roof for the elimination of loss, delay and fraction it will be a little city in itself; an aggregation of all things essential to the production of the production.

photoplay
The film selony under one roof will be located in the vary heart of New York two munutes from Broadway, at 50th and 56th streets and Tenth avune it will spread over a city block, or connewhat over four sores of land. It will house an army of 5,000 workers and will have a producing sapacity of 3,000,000 feet of film per week. This film city under one roof will among the largest in the world

among the largest in the work.

The comming motion picture colony will consist of three stories and a basement, as contrasted with the 20- by 25 foot studies of a few years ago. It has been laid out along scientific lines by authorities. on factory and office construction, with a view to speed, economy, and concentration in every possible phase of efficient motion-

in every positive prime of officers incom-pleture production, from filming to book-keeping to stenography and to starring In the basement of the building will be a high-pressure in the nasement of the building will be a nigr-present boiler plant capable of generating 500-horse-power, a number of enormous coal bins, and a great room fitted with complete electrical equipment for such a building There are to be extensive quarters for laboratory re-Eners are to be extensive quarters for laboratory re-search work, where a staff of chemical and photographic experts will devote their time to devising and im-proving mechanical ap-peratus and chemical for-

paratus and chemical for-mulas for the perfection of photography, film develop-ment, thing and printing, and to general experimental work for advancing technical

The prise spot of the whole building will be the top floor, which will be in the form of a giant studio that will allow panies to work simulau companies to work simul-teneously-companies that have heratofore been scat-tered widely and expensively. The roof will be supported by flying trusses, and not a pillar, jost, or obstruction of any sort will prevent directors any sort will prevent directors from netting up concery wher-svarthey wish. On this floor a director can stand in the center and point to anything he wants to make his plo-tures operatly—things he foreporty had to send many railes away to get. Eart



Piling the finished blanks with electric transfer tongs

will be stages both revolving and stationary property and costume rooms, shops for carpenters seene and plaster shops, 20 camers dark to ms and dresung rooms to accommodate 1,000 players. The last word in lighting equipment will be afeature of this studio and it is said that the cost of this apparatus will be over \$150,000.

Safety first! That is the theme throughout the 199 Parison. 018

Removing the circumferential fin and punching the axie hole

planning and construction of this unique motion-picture building One unusual feature will be the air condition outsing One onsatal rescure will set ne air condition ing plant, which will supply washed air for the whole structure so that the sake temperature will prevail throughout the building during all seasons of the year and working energy will be assured by constantly cool moving fresh air. The structure is to be fireproof of course, being built of heads, concrete and stool yet at no time will a person be farther removed than 100 feet from an exit. Moreover the vamps or inclinited roady syswill extend to each f the mployers and vehicles and It will a night to prevent jun during a hurried empty ing of the building

One roof will house the Lig notion picture colony Already the foundation has been laid and the structure is being rapidly pushed to completion. The building will be occupied by film editors, directors scenario writers office force the various film artisans and so on and will contain 35 fireproof and waterproof vaults where negatives and prints will be stored, 12 projection rooms which are to be per feet theaters in miniature

with muse and cushioned scats rest rooms, proporty rooms and dressing rooms for 1000 players. Not least in importance will be the laboratory and research department which will ensure accuracy in the various details of photoplay. The accompanying illustration gives some idea of the unique motion-picture studies. as it will appear when completed

## The Current Supplement

THL airplane was not the product of the war but it owes its present prominent pince in our ine and its greatest avelop-into other practical uses than those to which it was put in war but one of its umportant was uses as capable of extension into prace times. This use as extensively discussed in the Supervisive American Superint Markettan Superint Markettan Superint Markettan Superint Country of the Country of t render to constant conduct surveying and Mapping from Airpluses this viry suggestive paper probally indicates the next great development in the I ode ral mapping of the two-thirds of our domain which still awaits accurate charting. The great increase in airplane building by the Allies created a tremendous demand for suitable paints and varnishes with which to protect these relatively fruit structures from the attacks

rhaits(d) frail structures from the attacks of win I ram in all clouds and and as a air the reaction of the paint and variath makers in sideniused by de Wade. In the article Arching New Demants. The imposition of vices that have been prifected to air vertex extraining light placed at a point when it is amont be, constantly supervised are as (forth interestingly in Phe Undicated Light vised are set forth interestingly in in Challenge Light set could article in the sense on Recent Developments in Marine Lighting Professor Pock brings out some interesting and generally neglected facts about the Light Guing Puces of the Stars and also explains how we determine this power The Electrical Propulsion of the U S S New Messor.

continues to be discussed special attention being here given to the most interesting motors designed to drive her propellers They are of the Continuous-rated Motor type and under that caption on another page Mr Adams discusses the general nature of the type its application and the standardization rules of the American Institute of I lectrical Ingineers as ap-plied to motors. A classi-fication of the factors that an ten the life of our linen is accompanied by a popular discussion of the (hemistry of laundering from the point of view of the long-suffering customer Among the short articles is one on Burning I is e Anthracite and Bit in rous Coal Professor Bancroft's survey of the literature on The Color of Water is con-



An entire motion-picture eclony will be housed in this unressel building which is new being rushed to complete in New York City

# The Friendly War After the War

## Well Laid Plans of British Manufacturers for Exploiting Foreign Markets By David McFall

WHEN Great Britain threw her weight into the scale has August, 1911 not one Briton in a thousand shared Lard Kitchen is view that the war would last shard Lord Kitho at a var w that the war would hast three years. The mate in the street was so impressed by the magnitude of the conflict that its long continua-tion seemed to how impossible. The general optimizan-was reflected everywhit? Many of the London slope mad war deplayed a placard reading. Dismoses as usual during alterations of the bush to the Prince of Wales Rate! I und contained page for but four months. And innumerable other histograms of the reflected the same consistent.

months. And innume able other little manifestation beam computum.
Indeed, during the entire conflict even when it impatiful cosh beam apparent the good over yutterasse was, "Bunness as usual." While the form of industry was changed necessarily the reconstruction period froption. It was foreseen that, whatever the disabilities imposed by the war this period would at the same time present greater difficulties and offer greater opportunities than were ever known before the way the period of When America entered the conflict removing the last vesture of doubt as to its final outcome, drums of com vestings of course as to the majorate mean actual plans in these plans are now coming to light. The lines industry of north lealand about has allocated to adversaing purposes in America a sum approximating \$200,000. The intentions of many other great British industries are no

## The Federation of British Indi

The Federation of Breach Industries

No doubt the must important styp takin by Britash
manufacturers in res int years was the formation in 1916
of the newton in res int years was the formation in 1916
of the newton in the Britash Industries. This
organization is directly that the organization is directly as a size of a size of the size of t individual firm to take whatever advantage it can from

I be better roaditions thus or ated

I be keynote of the lederations task is found in a the keynone or the 1 decrations I task is found in a angle word—publicity. The largest ixpenditure of money, the employment of the best takint and four fiths of the machinery of the organisation are directed toward this end. In the singularly comprehensive publicity campaign that has been plained and that is some put into immediate and vigorous effect there are been put into immediate and vigorous effect there are being put into immediate and vigorous thet there are four outstanding feature—a stree of intrinational expositions, personally conducted tours through British industrial contern, a fuller use of the moving put ture film and a thoroughly organized newspaper and periodical

### The British Producer and the Foreign Buyer

Since the opening of the first intrinstical exposition in Crystal Palace I endou, in 1881, Great Britain has had a greater number of su ceasile expositions than any other one country, though to America must go the credit of having staged the largest and most attractive ones. In the matter of expositions therefore British manufacturers are hardly in position to instruct their American However the l'ederation has adopted an competitors However the Indonstron has attitude which is just resting and suggestive setting on put or two large expositions which experience has shown to be two often men attractive to pleasureseekers and curroutly attention than to reconstructed to seekers and curroutly attention to the students of mounts of proposes as new of smaller expositions as of-more, complements of a seal students of the students of saylving other than of those will be an Anglo-Greek Lapsenton to be lid in London in "Syttember and for those or the sear A representative of the Federa-tion is now a student of the search of the search too is now the search of the search of the search too is now the search of the search of the search to the search of the search of the search of the moderation of the search of the search of the powerty-ster, and the search of the search of the search of the start has condition of Greece and her industrial backhas shown to be two aften more attractive to I

waruness
The matter of arranging for personally conducted tours
through the principal industrial centers of the kingdom
promises to be muck more fruitful, as well as less couly On April 10th a special representative of the Lederat On April 10th a spr real representative of the I cheration shade for Brand, a country with which it is familiar through king residence, empowered to crit ad to Branilian importers personnal mirations to wate Orac Britan During the whole of the trip the Branilians will be the genetic of the Rederstion. To avoid the rook on which any such educational mission is apt to split, that of

favortism in being shown certain industries to the exclusion of others, it is planned to have the itinerary cover the entire Kingdom imparitally. In each indius trial center the manufactures and their organization as business with the metric to meet the victories both information in a business with a property of the contract of the metric of the contract of the co of lasting value. It can search that to be immediately productor, as no one in quest of trade can cashly refuse it whin it is sugar-coated with hospitality. The fact that the Federation has selected a bouth American republic for its first expariment of the kind may be rather unpleasantly suggestive to Austrian manufacturers

## Cinema Service for Manufacturers

Cisman Bervise for Manufacturers.

Perhaps the most intravel ng proposale—for at this stage they are most proposale ruler than accomplained fat te—art those relating to a fuller use of the motion posture film as a means of revilating information concerning Braths indistrates. Here refore the film has been much more largely used in America than in Great Bratism of rehowing industrial scenes and prote seaso. The reason is obvious. Owing to America a great order inside the stage of th sans, lumbering in the far Northwest and other pursuits, are not committy as new to the great mass of Americans as though they were carried on in foreign countries. This cannot apply within the narrow bounds of Great Britain, where every form of industry however a gregated or localized, is almost within valking distance of every other Great Britain has also labored under an irre-movable disadvantage in the 1 velopment and use of the 1 Due to climatic conditions American films are so the sharper and clearer than British films and there i mure pleaning, that it requires a subject of excep ore mire pleaning, that it requires a subject of score tonal interest to create a price rate for the latter for these and other reasons the limits public hear securious itself to looking upon the film as an interesting usough amusement device but not as one having any great odiucational potentialities.

One of the reset tests of the contraction of the c

columnical potentialities.

One of the great tasks the 1c is ration of British lindustries has not itself as to remove the British masonic plain as to the value of the film, and 1 urge a fulling use of it is all substrating how acrously the divergrate views the problem the following is quived from as used leading written pamphele: "Bound the World by the Film," recently issued under its direction.

Dis losits are of the cust may not be made a great medium of national advertor must. Producter of films and the courter have not because it and the courter have not because it and the films.

in this country have not been given the same farihites as in America, France, Italy standinavon and Germany for recording on the screen stress of national life and industry Abroad the man with the camera has been made welcome everywhere. In the United Kingdom has been commonly treated as a nussane or as esgaged in some frivolous pastims meaning softling to solid human as

Within a few years reader attendance at preture the attres has become an ideased universal habit. In Great Herian there are over its chandred million patrons per annum or twelve times the total population. It as a extraordinary anomaly that were 90 pretent of the films shown to those people are of foreign origin. What would be thought of a great country whose, nowappears were 90 per east foreign-controlled and representative of foreign mentality? mentality?

mentanty!
Inidicatelly, the pamphict in quarion pays America
this emphatic compliment
' Phrough the remarkable enterprise of the American
emona trade the United Stat's is by far the best adverthoms trust the United States as by far the best adver-tioned constry in the world 1 stry, day millions of people all over the globe have 1 of a their two American sons ry, American heroes as it better a business midu-tral and source have grounds where fast over farms and households, and American tests in all manner of articles

In the undeavor to attain f r Britam at least a part of In the indexport of attain f : Britain at least a part of the advantages which Amer, in owe range no fully, the Bederation makes several pra itsal concrete suggestions to the constituent member. Correspondence with thousands of manufactures was invited in a circular containing the following questions:

"Are you willing to give o canonal facilities at your office or your works, so that the producers of story flims may avail themselves of British industrial backgrounder."

Do you make any general exception or qualification in regard to certain departments, or any limitation of time compared? What features of your business do you regard as being particularly satisfuls for this purpose (e.g., interesting processes of manufacture, convenient or certain processes of manufacture, convenient or country of the processes of manufacture, convenient or country of the processes of manufacture, convenient or country of the processes of manufacture, convenient or posterior processes of the receiptents, at most But since all who reserve these questions are members of the organization conducting the questionname, and as each member has preceding the control of the processes of average speciator veves a film restroired to the acolustre portexpal of a single moderty, it at once necess to hus, at least sub-constroucy that it is a pad-for advartagement but when in connection with it is shown a background of picturesque or historic interest—and nearly overy British modistrial enter has such a background—the industry itself derives additional interest from its setting a tit he same time, and almost in the same proportion, all of the other typical industries of the consisty shaw in the benefits of the set extraorder, even though individually they might not be suitable for The I selection has nade another suggestion which is well worth acting on that individual firms make greater use of the portable properties apparatus by means of which their salazamen or travellers can demonstrate, in the offices of warrooms of the prospective outcomes:

which their salasmen or travellers can demonstrate, in the offices of wavercomes of the purspective customers themselves. It is pointed out that the requirements are quite simple—a small amount of wall space, preferably painted or papered in a high tin and a means of clos-tical connection, for which any ordinary lamp-bracket

In view of the strength of the British I ederation of In view of the strongth of the Britah I ederation of Industries and of the methodsal determined way in which Britah manufactures usually carry out the undertakings it is sale to assume that Great Britain at work will soon be figuring largely upon the severe. In-steed it is quite likely that even Amegican audiences well shortly be witnessing early morning processons of Manchester mill operatives with their shaws and dogs, or of the stack workers of Sheffield or the artisans in the ugly pottern.

## A Larger Use of Printer's Ink

More prosas: is the wider utilisation which the Federation proposes to make of the ordinary channels of printed publicity. Some two or three years age four separate organisations of manufacturers set up a body known as the Industrial Publicity Services and The States were held estirally by the participating associations, which were suited to service interest was obtained by the continue interest and the redemption of the arm service was obtained as the redemption of the service was been desired as the redemption of the service was now being a service with the service present of the redemption of the leadership Publicity Service and has taken steps greatly to writen at a pherical publicity flewing and has taken steps greatly to writen at a pherical publicity of the service was a service by extending to individual firms the kind of and rendered by extending to individual firms the kind of and rendered by extending to individual firms the kind of and rendered by extending to individual firms the kind of and rendered by extending to individual firms the kind of and rendered by extending to individual firms the kind of the revenue will be develoded to furthering the interest of the Federation.

The Industrial Publicity Service is now functioning structure of Strata industries, it is preparing technical end descriptive news matter for the foreign press, and it is preparing devices and version advertising media, (Constituted on page 667) More prosest is the wider utilisation which the Fe

## Science in the War

## A Resumé of the Work Done by the Bureau of Standards

By C. H Claudy

That hom me varied in kind and so large in extent, that by actual count of words a complete entains of its varieum regulations would file a gender space than as here available. Only a few of the meet important phases an possibly have be mentioned. Also its quate important between the country of the country of the region of results that "filed is the most important. But it is preside to may of several that "they are not Cortigitly amount when its the "third they are not Cortigitly amount when its the "third they are not

report or remain that "that is the most important bit it is pessible to my of several that "they are not least important to the properties." Contributy among these is the Kolster derection finder, as instruments derected in the Bauves of Standards by remaining the standards by the standards the standards that the standards the standards that the standard that the standards that the standard that the standards 
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between the control respond to locate enemy between the same opposid principle to covering to twentile the covering to twentile that an expect lass is known size of propagation, the difference between visual and anothe seath of gas free in reach manning of the distance, and that were made to the control of the control o

purposes which are not now even being mentioned and that any catalog of the Bureau of Handarda works in war must meritably be incomplete. Not afrequently work was these done which is known to only two or three controls of the control of the contr

described to fill this page. Much of the work has been concerned with various methods of dissessmenting or reserving intelligence wireless has played a large part in the war and the Bursau of Standards has played a large part in the war and the Bursau of Standards has played a large part in the war and the Bursau of Standards has played a large part in turbles. Through exprensess there concluded do not the described the sink set has played a large part in turbles could odd to the wretten experimenter who has always thought that a free and high serial carefully insulated and a proper ground, were midopensable for researing otheric vibrations. Yet subs near the Atlantic coast at the substances of the inference of any of light with a far below the visual range. Inflare-red lightle can be the way of the ultra-riched region. The Burcas developed a neithed by whole saffra-red signals can be both next and received under the contract of the ultra-riched region. The Burcas developed a method by whole saffra-red signals can be both next and received understand the saffra-red signals can be both next and received understand the saffra-red signals can be both next and received understand the saffra-red signals can be both next and received understand the saffra-red signals can be both next and received understand the saffra-red signals can be both next and received understand the saffra-red signals can be both next and received productions and only be received when the redigiated has like resembles apparatus in position to carried the rays dividence of the prediction and over which could be said.

against an interesting and on received when the Nediposed has his recognitive apparatus in proculton to existtion ray directed to a predictormized point. The method is and to be quelle pageints and the application to war work

If there was any case piece of work which could be and
to be more important than the rest it may have the
done with gages. Standardination and interchangeability of parts is fundamentally a matter of pages
The securacy of any standardination and interchangeability of parts is fundamentally a matter of pages
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weight and their remetance to wind An airplane radiator should give as little he ask r sestance as possible and yet provid the necessary coloning Incidential it must be noted that there is such a thing as a lot efficient radiator. When it fro its at high altitude it is ements on motor than there is sheen a stang as a too efficient radiator. When it from a fat high altitude it is no longer described. More than 50 types were con-mitted in these tools with the result that American planes are models in radiator design.

places are models in radiator dragin.

As an instance of the very sequence of the various has a matazer of the very sequence of the very sequence of the sequence of the very sequence of the v

are equippes was series and public will be supplied with them before very long.

A blind man is not more helpless than an army or navy without eyes. The optical instruments used in wardars make a very complete catalog of optical apparatus. Of course field glasses, telescopes and camors instruments persecupes and searchight murrors are a close.

second Modern lenses require special optical glass, bitherto supplied this country largely from the great Zens works at Juna. At the time the war broke our there was but any lima A the time has war broke our there was but as I man. At the time has war broke our there was but into optered glass in Amount of the comply the demands of the complex of the com

always and could not be accomplished. The development of a cotton fabra as strong as inem for arriphane wing construction has already received much comment in the public press. It is well known that the Birrau of Standards has experimented with and developed a paper for wing covering which has stude to recommend it and which has ample strength for the strains to be put on it. Nor must the discovery of a messas of making ortion blandeds as warm as wood consider a simple result reaction materials during the period with a millions of army blankets and much tich for army defining was a visal noced and not council would be comed to the simple of the control of th for army clothing was a vital need and not enough wool in the country or obtainable to satisfy it

for army dothing was a vital need and not enough would in the country or obtainable to saidly it. An avator and his plane are no better than his in strument. The story of airphane instruments is a large one and the desired of the said 
chamber
As an matance of the practical application of scientish
mirestigation to money saving, the War Department
construction, the Bureau maved it 8000 a day I be
problem was pit up to the Bureau "Rowe an concate
he made to harden rapidly" The investigation resuited in advice to his four per cest science in closely
with the conserved which results in hardening the institute
(Combinate on ages 600)

# New Ships of the British Navy

# Influence of the Battle of Jutland Shown in the Latest Battleships and Battle-Cruisers

EVIDENTIA the British admiralty believes that the tra of keen e mpetition and seen y in warship designs and constent from passed with the passing of the ferrican fleet of the body has recently made julie design and construct non-process white cuttle making the feet man field. I it he if it has been cuttle made, jud he through papers r at l v l l the feometrucers before the Institution of ward Archeteria a remarkable complete statement of what was done cluming the war in the commence than of every kind of warship from devaduse construction or every land of warship from dwad-nought and hattle cruser I own to putted best. We publish her with a set of drawings also using the remova-turers in this great program which represents a total of about 4 we million tone and involved the laps inditure of about 51,400,000 000.

When the was opened in 1911 Creat Britain was completing the shape of the Ir of Duke class which carried ton 155-inch guiss in the turicts on the center I we of these were ready just before the war and line I wo of these were ready used before the was a-tile other two shortly after it tom. Due to the tossens learned at lithent a countershie amount of additional protection was added over the magazines of this Lasa-a change which was made in practically all of the capital ships at the same time. It is interesting to learn that ships at the saust time. It is interesting to heart that in only one case, during the engagement of heart that in only one case, during the engagement of heart that in only one case, during the engagement of the least that the first to mount the 18 tinth gun of which neght were carried. He speed was raised to 28 kinds and of two adopted in place of one law and the first of coal We are the coal of the engagement of the enga

gave and received heavy punishment hat were not seriously damaged or put out of action. Additional protection was given to the magazines as the result of that battle

The next battlesings in order are those of the Royal Novereign class whose de-signs were based on the Queen Flirabeth 1.3 make them more homogeneous with the majority of the dreadnought slips the speed was reduced to 21 knots but subsequently a change was made from cod to of and an its trains with 1,000 tons of oil the Revenge attained 22 knots which is equivalent to 34 knots at mean draft the thick protestave donk at the center of the ship was brought up to the level of the main deck

Particular attention was paid to underwater protection and, subsequently to their launching an outside buige

and, subsequently to their launching an outside builge was fitted to all the ships of this class. It is should be mentioned that the paper residence to boostly from which their particular and takes was given by Bir Lustine of the Victorial Victorial and Consecty, who was responsible for the builge method of predection and recumum used in for the Lustine class of vicesies in 1916.

class of vessels in 1916
The battle-crimers Renown and Require which as mark but ica written see originally lact down as battleships of the floor down-creen part but not seen the second part of the second part of the second part of the lact of th the battle-cruser type became very apparent and on the intentive of Lord 1 sher it was decided to complete the instantive of the property of the control of th

knois As a matter of fact, the Repulse made 11), knots in the deep condition and the Renown made 24 d knots speed at mean drift. I transfable record of 17 months for construction was me is in the case of these in vessels. It has hips are being will reported upon in their sea service and they set able to maintain their med

## Light Crissers, "Couragoous," "Glorious" and "Fund

While the doners of Renown and Repulse were withe the designs of Renown and Repulse wers in progress the sheef constructor recived instructions to disagn some with high speed abil a carrying powerful guns which were to be capable of maintaining the greed in moderate wanther but were to be of higher speed in moderate waster. But were in the same class, so as to be able to navigate shallow waters it so desired it was decided to build. Courageous and chonous It was desided to build Courageous and thorons on the lines or very large light runs is; giving them a five guns of the boavest radher, so that the would be also overtake and suit any assembly light runs or radie without some time that of a first light runs or radie without a large three professions of the courage and the state of the state

guns. They also carry an anti trip do armament of - PROFILE AND PLAN - PROFILE AND PLAN - . ---A HARRIST HE WAS A STATE OF THE PARTY OF THE

Light cruisers of the "Curlew" and "Raieigh classes built during the was

those of the "Renown' and Repulse I hey were protected with two moles of arms plate on top of the moments and plating, and a tim protected dock was worked force and aft which was underably thickened above the marsunes. Hey also shows all the modified bulgs under water. Hey are driven by a four-shalf arrangement of gazzed turbins sink as is used in the British light cruser. Champion the (namenason constitute of double beliad gazzing. With 80 000 chaft horse-power 42 knote was essent distanced on trial and was not cold in merrino.

Was exceeded in service When the Courageous triels in heavy weather signs of weakings developed at the fore ado of the forward turns where there is a loss the inr. and of the forward sure! where is a loss of strangth due to the break in the dack structure to admit the barbetts. The addition of doubling plates served to correct this. Experience with this ship shows that speeds of 30 knots and over cannot be maintained in navy weather without danger of overstreaming a ship s

structure. The third ship, Furrous, " as similar to the "Courageous and Glorious but she carns a more pronounced bulg. In piece of four 18-shoch guns me sangle gus terrer forward and another sit. Before whe was completed, the urgent call from the fact for the was completed, the urgent call from the fact for fact arraines carries set to doing sway with the fore turn, and building on the forecastle deck. a large hanger to house 10 machines,

with a 160-foot flying-off platform above it Later, the after turnet was removed and a landing deck 800 feet long, reaching from the funnel sit, was installed Fibe Furcois carries ten 55/4 and guan On trial the slup made 31½ knots with 94,000 shaft horse-power

## The Light Crois

The pre-war modern shape of the British Navy was designed by Sir Philip Watts, and among these was the light crusses. Architus which became famous mis analyse cross of the control of the Architus. Type, and it was desided to utilize powerful machinery of a type approximating the type hathasto used for destroyers in order to sessies the designed shaft horse-power of 40 000. We illustrate two vessels representing respectively the "Curleve" class and the Radeigh class The "Curleve, off feet over all, displaces 4,500 tons and with 40,000 horse-power shored cauch gets and two Bushes hat-aircraft guan In the case of some of the vessels of the "Curleve" class the case of some of the vessels of the "Curleve" class the horse-power was developed through couring upon two shafts which involved a transmission through each growth of the control of these ships in that the guan are all carried on the control in the case of the sea of feature of these ships in that the guan are all carried on the control in the case of the control on the case of the case of an are the meteric as registered.

nn are all carried on the center har and are therefore audi-side on other beam. The superpased method of his superpased method of his adopted so that two game are available ahead and va-astern, a blast scroon being provided to shaled the game detachment of the externe forward and after game. The shape ander to the lovel of the unper deak are

level of the upper deck are protested by special high tensis plating of from 2 means to 1½ and 1 means to 1½. throughout the machinery

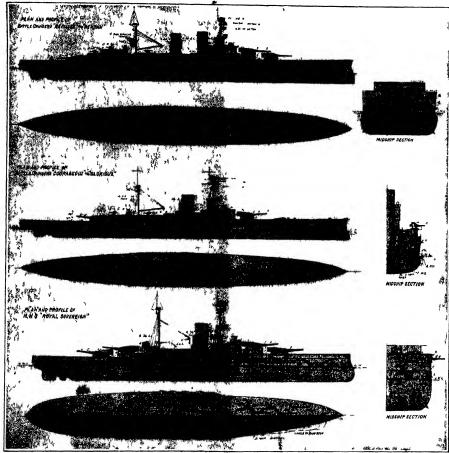
throughout the machinery mars in addition to the 1 med sheel plaining. The "Rakenth class is a heavier type of light cruiser designed for occan work in any part of the world Their four-shaft geared turbine engines of 70 000 horse-power laws drived the sheet of the safe have driven the shape at a speed of 30 knots. These vessels are 600 feet long, dasplace 9,760 tons, and mount seven 75-inch guns, 8ve of them on the center into of the shap and one on cash bears anulching. They desired the state of the shap and one on the same anulching. They desired which are on anti-sarrorat mounting. The maximum and corrected on the same of the shape of the same of th liave driven the ships at a

asvent. mounting. The maximum and protection the maximum and protection to that of the smaller light crusters. They also earry the modified bulgs below water.

I be destroyers unstabling fieldlis leaders, built during the war vary in length from 376 feet over all to 889/5 in the war vary in length from 376 feet over all to 889/5 in 1,200 teem, and the upset at lead during from 3,100 teem, and the upset at lead durit from 44 to 8 knote. These are contract speed unless in most chest waves greatly exceeded. The world's removal for destroyer good has recombly been gaused by a 'Argette books, which in a four-hour run at 86-simonthe has preceivity maintenant of the destroyers consents of the three and in the later destroyers from 45 knote. The streament of the destroyers consents of four or at 1,500 times and 65 knote, five all-fields given are carried consents of four or at 1,510 knote facilities. In a succeeding more we shall give all-streams and foil details of the "Turquessee" which is the destroyer that made the mean few-hour speed of 39,6 knote, shows mentioned.

## Marrie ...

The monitors built for the war samped in length and duplessment from 177 feet and \$25 tens to 405 feet and 5000 tens. The 355-feet weeks applied two dispi-or can \$3-feet gun, the larger monitors mounted a gain of 13-feet, 14-maje or 13-met gains.



British battleships buttle-ornisors and large light cruisers built during the war

## Blind Men in Testing Laboratories

N 1916 50 blind men war victims were placed in the IN 1016 50 bind men war vucture were placed in the flawwork abservatory part of the military maintion works of Spandaiu says a British trade paper. Here were first trained by women and later instructed by blind men. Originally they were only given very simple set work of the go and notego kind The disear monotomy of this compastors proved very had for them however as the scope of state work was gradually however as the scope of state work was gradually increased to the scope of state work was gradually increased to the scope of state work was gradually discovered. The scope of state work was gradually discovered. The scope of state work was considered to the protection, of course, the lathe is stopped for instance when the tool has done its work for the time, and the piece is automatically thrown into a hassiet for examination by jike nature. Fraction thanges set scale in the scope of the scale of the scale year that year they were said to do on an average of 50 low, last year they were which which blacked seen could have done. Many of the men are superried, and the wively partly occupied in other departne to of the establishment act as their guides

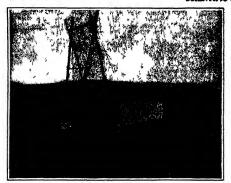
## Paper Bales Instead of Boxes

Paper Bales Instead of Boxes
THE scavity of shipping spaces suggested some time
ago that great saving spuid b effected by packing
textiles and all other soft sizes also in bales instead of
in cases
Many balable goods can be compressed to onshalf or one-third their original bulk thus effecting, a
reduction in freight elatigue, a total elimination of the
sort of cases and an economy in the handing. But the
substitution of bales for cases could only be effected
through the use of a thoroighly protective wrapping
blands the outer covering of burkap for the latter is
good only for the ability to hald that belt together and
must be supplemented by semething that gives watertightness. tightmens

tightness As the result of practices toots made by various bureaus of the Government, with some commercial assistance two types of waterproof paper have been

select dfrths jurp se O ons sts ftwo 30-jound hraft papers emont dig ther wit say! It m is different then so crimped or shy left it dig shi hat will write the state at all rill friends papers between the same and the source of the same and the same stance

A pressed bale in a water; ro f cas g covered with burlap and strapped with ste i bands not anly is safe Against every exposure but saves cases or crates s ves labor in handling saves the handling of empty cases and when freight charges are based on cubical cort at aways half of this item. Baling means vastly nore than cheaper and safer shipping it means that the packing case will be abandoned wher ver the bale an be used







Near view of the front end of the fuscings and the struts for supporting two of the fuscing of the Handley-Page

# The Non-Stop Trans-Atlantic Flight

Describing the Handley-Page and the Vickers Vimy Bomber Entries

THF non-stop trans Atlantic flight still remains to be realized at the time of writing. Indeed while the trans Atlantic flight has I on achieved by the United States Navy scaplane NC-4 there is nevertheless considerable interest still stached to the

siderable interest still stached to the various contestants now ready to under take the first non-stop flight between North America and furope. And the very nature of the non-stop flight as well as the huge prises to it claimed by the first successful attempt gives the present contest a real sportsmanship touch that never fails to invite populsar not rest

never falls to invite popular interest.

Iwo machines are now ready to undertake the great flight in fact it may be that one or teth of them will have made the attempt by the time this reaches the reader. At any rate one of the entries at the huge Handley Pag, while the other is the Vickers Virny Bomber Both machines are distinctly military machines both of them were constructed for the Bondbling Berlin. The auditor profits the purpose a mad the trans Atlantic flight context has given them a rail op portunity of proving the rworth Multiple-signed of the profits of the province of the engined reliable powerfully full great load earriers and fairly fast both entries are not far from ideal for the ordeal which they have set for themwelves

When the Handky I ago was constructed for bumbing Berlin she carried 1 190 gallons of fuel and a propertional oil supply a 200-pound wireless set 6 630 pounds f bombs 12 machine guns weighing 557 pounds and a cross f seven men. She made 90 miles pounds and a creev f seven men She made 90 miles an hour on her test flight with this load. For the trans-

Atlantic attempt however the machine has undergone some modification Her gasoline capacity will be about 2 366 g illons or n aiderably more than the N( 4 with her 1 900 gall ns This fuel capacity it is estimated will give the Handley Page a cruising radius of 22 hours of something like three hours leeway in making the Irish Coast with ordinary weather and no adverse winds

It is announced that the trans-Atlantic crew will con sust of four men-s pilot and observation officer The



n Universal a Universal Pneumatic-tired wheels of the Handley Page machine compared with a man and a boy

perience in long-distance, over-sea flights Frederick Wyatt of the Marconi organisat: n is to be radio operator. The Handley-Fage attempt is strongly suggestive of the successful one of the Un ted States Navy, for the reason that the matter is being handled in a businessitie.

long by 200 yards wice, and all of it has been cleared of obstructions and levelled and rolled, providing a hard surface for the hawly-ladent machine.

The Vickers Viny Romber, while a higher than the latter of the hawly-ladent with other than the latter who consensated with other than Hamiltonian and the latter who consensated with other than Hamiltonian and the latter was standard to be power plant comprises two standard to be power latter to standard the latter was been increased to 585 gallons, and with the segment of the standard to the latter than the latter with a standard to the latter than 
and, who has been days 1912. He has



The trans-Atlantic Hardiey-Page machine, which carries 2,566 gallens of in non-size cruise of 22 hours

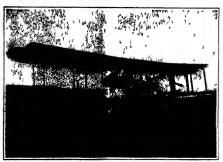
Ciptais Alessk dad good work on the Thritish frost, where he won the D S C. He was eventually taken prisoner by the Turks, owing to engine failure, and re-mained as such until the end of the war. The navigator will be Lieut Arthur W.

The angelor will be Lieut Arshur W
Brown, born in Glasgow, Souland, of American parastes. In the course of the war young Brown was transferred from a Manchester premuest to the Royal Flying Corps as an observer, and was wounded and taken prisoner in 1915. Be was later interned in Switzerland, and repatriated in Deember, 1917, since which time has been sengaged with the British Ministry control of the Switzerland, and repatriated in Deember, 1917, since which time has been sengaged with the British Ministry control of the Switzerland, and repatriated in Deember, 1917, since which time has been sengaged with the British Ministry control of the Switzerland and 
## A Better Searchlight Unit By Albert A. Pashby, Sorgeant-Major, C. A. C.

oy ameri a. ransity, Sergeant-Majer,
C. A. C.

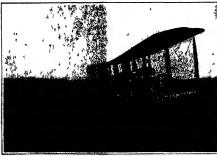
AMERICA'S program in the six during
The the last year of the war had greatly
insproved, but which might have been so
to be the serge of the serge of the last of th

The new searchlight has a divergence of less than three-quarters of a degree, which corresponds to a width of 140 feet at a distance of one mile. The sainent features of the design may be found in the novel type of breech-loading cartridge mechanism and in the accommon and the saint of the mechanism and in the ac-cursory of its metal mirror. The magnetic control of the are parasited a much higher current density at the elec-trode tips, 400 amperes per equare into being situated, at 65 volts. The discussion of the residence market of



The Vickers Viny Bomber trans-Atlantic flight entry, which has a cruising range of 2 440 miles

carbon tips. When one stops to consider that the entire output of light rays must be 1 in hed in a pencil of light subtending an angle of 112 legiess some ries of the accuracy may be obtained.



Another view of the Victors Viny Bember, which carries 865 gallons of fuel and 86 millions of ell

This searchlight is the most powerful in the world, giving a beam of an intensity of over three times that of the most powerful searchlight in use at the beginning of the war, that is to say, for searchlights using a 60-inch mirres, beam intensities of 40,000,000 to 45,000,000 were

available whereas the new Lynn lamp gives 160 000 000 apparent beam caudi-power. The quality of light is far sperior also the spectrum of light approaching daylight mor nearly than any other artificial light sources. This of course more clearly reveals the clusive arriplant camunfaced and flying at high speed at a detacter of the rife is cought miles.

While the scarchinght weighs 1000 While the searchight waggs a vow pounds it was ne essary in order to make its movements m re-buly controlled by not more than two m re-ti-mount the entire device upon a light truck equipped with pneumati tir d whicels. The turntable and trumin a srm supports were of cast aluminum thus providing a very strong rugged and light construction. The mirror support is of steel in arried on ball bearings by means f a spoked wheel design and the breech custing which in turn supports the cartridge type mechanism and the occulter for warming before the beam is flashed on the enemy planes. The arc controls feeding mechanism ar striker etc are at the rear of the moth orientation f the team is accomplished by another man operating at the end of a

12 f or radius rid (arrying a michainer which facilitates the pointing of the beam.

The sarch highlight and supporting device required a self-contained and complete electric power plant with a contract capable of a 2b-kiloyard coupur fin order to produce this result a 185-inch.

In order to produce this result a 185-inch. This has

where these chansals was solected. Into has an eight-yhinder engine with maximum output of 80-horse power. An automobile generator with holl was aft and doble acting clutch was attached. The generator clutch governor and other details have a total weight of 650 pounds.

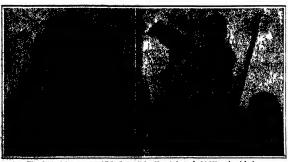
During the war the British used the gasoline-electric cinnibus taken from the streets of London and the French attached generators t the Renault trucks to provide a power plant for their searchlights. The new truck unit including the 60 inch searchlight was responsible for many im-privements. The overall weight was redured 10 000 pounds the speed moreased from 15 to 45 miles an hour and the cost reduced nearly 40 per cent. The new machines weight of ready for field service 9 000 pounds. This included fuel eightcylind r gasoline engine 21 kilowatt gener ator 300 feet twin cubk and reel switch-board the 60-inch scarchlight with carriage and the personnel of five men to operate

the unit
During I corusry and March of this year
three of these searchlights and power plant
trucks completed a test from the West trucks completed a test from the Wost Lynn works in Massachusetts to Calstrom Field Fla

a distance of 2 000 miles when the roads were hub deep with mud | the Government was entirely satisfied and though the war has ended it plans to use the new device at its coast defenses and naval stations

### To Restore the Ruined Libraries of Serbia

A LFAFI FT issued by the I intente Committee of the Royal Suciety of Literature in I ondon describes the wanton destruction and pil-lage of Serbian libraries dur ing the war and appeals for aid in the task of restoring these institutions The Libthese institutions The Lib-rary of Belgrade University, the leading collection of books relating to the Balkans in the whole worl I and also the most mportant library in Serbia was systematically pillaged and destroyed, the large lib rary at the monastery of Dechani, dating from the fourteenth century and in h in historical documents under went a similar tate and many others fare I likewise Every printing pressin Serbia was carried away r destroyed by the enemy.



rehlight that contains 30 parts instead of 1,000, and weighs less than half a ten

# The American Precision Block

An Industrial and Scientific By-Product of the War

VIARS ago engines and rifles watches and other complex medium of in fact all things continuing a quantity of parts. a could back assembly which the only one of it land wrone of thousands was an in dividual problem at a parte were carefully fitted together by trial filed and scrap I by hand to match as perfectly

by trail field and serial. By hand to match as perfectly a possible. It my perce serving the same duty in two machines could be unitrihanged only by happy as ident to the hill for repairs and replacements was a havy one loday we do not do it that was. I hamps are no longer most the year one of the factory as not with the assembled whole at all, but refute with parts. These are made in quantities, often in different shops and as a matter of equation of the in different shops and as a factor of the parts of t

at fits and functions

auguen casualty into its place and as a matter of course it fits and functions.

This quantity production of interchangeable parts is made possible by the system of telerances. Instead of leaving the problem for the workman to wrestle with every day the designer undersory the workman to wrestle with a severy day the designer undersory thousands to anothe a great member may wary from the specified dimensions without impairing its fit or its operation. A part is them made with the idea only that it shall fall writing the state of the specified dimensions, without impairing its fit or its operation. A part is them made with the idea only that it shall fall writing the state of the specified of the This quantity production of interchangeah

The use of solid master blocks was in itself sothing new JSut previously they had been made in the tool-room of the indevidual fastory, with great difficulty and expense, and only in the several mas required by the work of that particular factory. The whole notion of turning out pression blocks on a commercial basis, in complete sets within a stripulsted securacy, at a prior making them available to every tool-maker, was a novel one. And more than that—the bold dame that the idlationes of a pulse of the blocks where of the pile was in one to controllection of all previous appearance and could not be accepted without the most regorous demonstration

## One Plus One le Two

a. If we take two ordinary soleds an inch thick and place them together, we may get a figure 201 inches theck or 2001 anches thick but we will never be may chan a get a figure senselly two inches thick This statement as made without reference to the consideration that the alleged one-most blocks will full to measure something that the alleged one-most blocks will full to measure something the third that the sense of the third face who have become the third that the sense of feel, but when we get to taking about inderections and the They may fit very nicity so far as we can see or feel, but when we get to taking about underections much the sense of feel, but when we get to taking about underections much the sense of feel, but when we get to taking about underections and the sense of feel to the sense of feel to the sense of the sense of feel to the feel to the sense of feel to the feel to If we take two ordinary solids an such thick and place

distributal and Scientific Dyek router to force out these patitire When this is deap with skill it is agriculty found that is spite of all privates arguments to its agriculty found that is spite of all privates arguments to the contract the thorisons of any problem that the same and the same and the same argument of the contract of the same argument of the same ar hance the attraction that centra between molecules of a rangle puce mapth to approximated Johanneon believed that if the surfaces could be made flat enough their molecules would be close enough after wrangen, to sease upon one another with the full natural grup, to that the two pences would coalcover at room temperature and we would get a molecular weld. Without ruling out all assertance from these factors, the Bureau of Standards has recently put forward a turid explanation. When the blocks are absolutely clean and dry they will not wrang. When too much all left on them they will not wrang. And some one aid wrangas more than others.

## Serface Tomeion and Process Measure

So the Bureau believes that wringing is a use No the flureau delieves tank writing is a maniceature of surface timmon on the part of the oil. The molecular throughout the interior of a mass have neighbors on all sides, those at the surface have the same otherive power, but fever neighbors to exercise it on. They can use up their coheave potential only by taking extra stype on one another. All fluids show the resulting surface tension but fewer neighbors to asserties it on . They can use up on an archer . All fluids show the resulting surface leading to an archer . All fluids show the resulting surface leading to a surface . All fluids show the resulting surface leads to the surface . The surface sur

# The Amillion Way

Union there are two ways of scheering the same remarkable result, however, we shall cone know all about it. For right now the very thing which is so surrounded with snystery and houte-pouts in being done here in the Upited Scheme. House are being turned out at low

cost on a commercial scale, with errors measurable body in millisenths of an hoch. Contrary to Swedish grandles, the whole story of this abstracement will go believe the public as fast as it can be presented. For the special way many not tell how the gaps are obtained for the passars of the passars extension. Development of the passars extension, however, and in the measurable of the passars are presented as the process of the passars are presented as a present deal of interest that can be told about the American block gaps and the problems most as processes in a processor in the problems most as processes in the problems most as processes in the problems of the problems most as processes in the problems of the problems most as processes in the problems of the problem

time tuere is a great cast or interest made onto the absort the Amarcan block raps and the problems met in professing at the problems met in professing at the problems met in professing the Major William E Holes of 8t Leuismonth and the Major was a great ausance that consequences of his invention. In his beausem he had occasion to use the results blocks, and in such a manner that their equare forms was a great ausance. This contagnaturely retrieval the set of him to wonder whether he couldfult makes he own in ages and with them, of course, gages for cheep people. He felt that the shape of the Structurel and of the country of the set of the s

Advantages of on levenier. At the same time Mr Hoke had written to several by tool-makers and to two governmental bookes, but he got no encouragement from these sources. He does not hold this against anybody, he admirs that such a dam as he advanced might much more reasonably have been supposed to come from a creak than from a regular fediou who have what have the same and the supposed to come from a creak than from a regular fediou who have what he was the same and the supposed to come from a creak than from a regular fediou who have what he suggestion of the formarrise Azennoux, he got about a treat for Washington, do-terminate to jam he gage down noneabody's threat. For this purpose he subsorted the Bureau of Beauchards, and in a face-to-face encounter, where he could really tell something about his invention, he made such a showing that the Bireau gave him places it. In two days he had a machine making page blooks, and as featured to the substantial of the substantial had been also been also as turned them out the Bureau toried them, with its regular mir convotes outlit, and other rowness of measuring. After a week of this, Mr Hoke was just about ready to pask up and go home. Gages in which he could find no error, and which he had supposed to be secured to manufacturing and positions. Gages in which he could find no error, and which he had supposed to be secured to an unbeard of degree, them that perhapt the hitch key in the measuring methods. The Bureau twas using strictly membanical means of testing his gage, and us he cant over in him that he probable errors of observation melecular than the more which he did not possible the substantial perhaps the hirds he properses with the first product than the necessary manufacturing the product of the substantial perhaps the hirds he produced. But the Robe study dight there is we desired would make such a story, necessary, by mechanical means, at was found to the could fine error which he did not prove the same on the secon, the latter was in the lead out story, n

# Miniming with Light Wires

The interferoparier measures by dealing with light wave-lengths, which easy between its and dis millionths of us took for the wholes posterits. It is repeated in experient a admittal to adjust and use of. It is now and injurious for the same reason. But it includes that admittal to measure the cross of the Robert support, the condingly the Rosense of Headquist way contented note.

# One Hundred Thousand Horse-Power Steam Turbine

From Piston to Turbine-Reconstruction of a Great Power Station

IN the Scientific American of January 11th, 1902, there was published on the front page an illustration of from page an illustration of one of the sight great recipro-cating steam engines which had just been completed at the new 74th Street power station of what was then the Manhattan Elevated Railway Company Each unit 8,000 horse-power and a max-imum of 12,500 horse-power, and each consisted of two compound condensing ensempound condensing en-gines, coupled to a common shaft, with an alternator mounted on the shaft be-tween them. The 44-inch treen them The 44-inch HP cylinders were placed horizontally, and the 88-inch LP cylinders wortically, the two connecting rods of each engine taking hold of a common crank pin 32 feet in diameter, weighing 185 tons, served as a fly wheel Each pair of engines weighted 720 tons. The maximum possible output of the eight scena units with which the building was fitted was 100,000 horse-power.

There has recently been installed in the same plant a magle triple-compound Westinghouse steam turbine which has a maximum output exactly equal to the maximum output of eight units, including axteen com-

pound engines, that previously fitted the engine room With the development of the steam turbine, especially in With the development of the steam surbine, sepecially in the larger sizes, the consony both in flor space and bulk and in steam consumption of the turbine, was so marked that it was only a question of time before such large reciprocating engines as those in the 74th Street power house would be replaced by the more modern prime

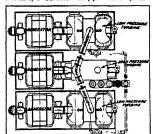
This substitution has been taking place during the past few years. Not only have the reciprocating engines of large power stations throughout the country been of large power stations throughout the country been gradually taken down and turnine units creeted in their place, but there has been a notable increase in the power of these midvidual units themselves. The first turbines to be installed at the 74th 'treet plant were of the compound type with high and low pressure elements Each of these was direct-connected to two generators, there being non generator on the high pressure and one on the low pressures shaft. The maximum output of each unit was 60,000 k w These units an aboven in the tree has remainly been completed the great turbine referred to above, which is remarkable as being the most powerful steam eaging in the world. It consists as can be seen from our photographs, of a central high pressure

be seen from our photographs, of a central high pressure



Blading one of the low-pressure retors

turbine and two outer low pressure turbines. Lach turbine is direct consaccted to its own generator. The steam is led to the high pressure element at 20% pounds pressure to the square inch. After it has passed through; it is led by a bigrasted stam pape to the low pressur.



Plan view of the triple-compound turbine

cylinders, as shown in the accompanying diagram. It enters at the center and the steam flows in opposite directions through the successive rows of blading. I rom the low pressure turbine it passes to the condensers which operate under 29 inches vacuum

The speed of rotation i 1 500 revolutions per mirror and t this speed with 20 pour is pressure at the throt tie time wonderful engine has a total loss power of about 100 000 and the total output itor three general re which it perates is 70,000 k w The generators are each rated at 20 000 km continuously and they have a maximum output of 23 700 k w for two hours I waty five cycle current at 11 000 volts is current at 11 000 voits is lelivered from the main power house to the sub-stations. The floor space covered by the big turbine is 52 by 50 feet and its height is about 20 feet. When the turbine is running at maximum load 826,000 pounds of steam pass through the blades

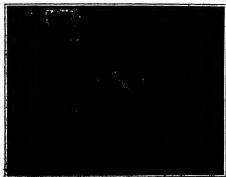
of the turbuse per hour, and the water rate is less than 11 pounds of steam per kilowatt hour

### The Effect of Great Pressure on the Electric Properties of Metals

A the great majority of the metals tosted by Bridgman increase of pressure lessened the electric resistance, antimony and hismuth being the only exceptions

According to the hypothesis of dual electric conduction the total conductivity of a metal is the sum of the conductivity due to the action of the associated electrons ductivity due to the action of the associated electrons, and that due to the action of the free electrons. It seems that increase of pressure should increase the former and decrease the latter, and as the former as probably much larger than the latter in most metals, we should expect the usual effect of mercase of pressure to be an increase of total conductivity, as it is in fact But in the case of metals for which the ratio of the two phases of conductivity is exceptionally large, as it probably is in antimony and in bismuth especially the latter we should not be surprised to find increase of pressure producing a decrease of total conductivity,

as it does
In most of the metals tested by Bridginan increase of pressure produces such an effect that heat is absorbed of pressure produces such an effect that heat is absorbed when a strain of electrons goes from the compressed to the uncompressed metal that effect being especially large in bismuth. Now this is what we should expect from what has just been said for if the fraction of the current due to free chetrons is smaller in the compressed counts due to Iric Crittons is smaller in the compressed metal than in the uncompressed nonnation must occur, with absorption of heat, at the junction where the stream of electrons passes from the compressed to the uncom-pressed metal



Andreitenter of strings the filters the contracenting engines at a New York power station



A 100,000-horse-power steam turbine

# The Service of the Chemist

A Department Desoted to Progress in the Field of Applied Chemistry

ed by H. B. HCWE Cha

### The Present Status of Our Dye Industry

HFRT in America, there are many instances in which the founder of a business has lived to see the st ablishment gre w frem a one man affair to an organism tion of thousands but quite generally the process has required years and development has been at a rate fully required years and development has been at a rate may pastified by conditions with a could be arrefully studied in advance. In the dyo industry we hav an example of an entirely different way of having it do things.

In many respects and considering the conditions under

in many resisters and considering the contrensa under which it was done the work of giving America a dys industry in four years or less may be considered about the most remarkable single achievement in our industrial history. Unlike other notalise advances which have consisted in commercialising new discoveries and inventions or greatly improving upon existing products, the dye manufacturer knew the wares he was expected to supply but at the start he had insufficient raw material,

supply but at the start he had maufficent raw material, asked to hard-and sales organizations, required a plant and was seriously handrapped by the cumulative offect of a long period of skillful competitive advertising A discussion of what has been done thus far and something of the precent status as well as the possible future of our dye industry may be properly pracased with a few words regarding the complex nature of the problem and words regarding its complex active to the protein and the factors upon which (cermany seems to have counted to defeat the project of American dyes made in America by Americana Attention has been called previously to the hatory of synthotic dyes how they were first dis-covered by Pekin were siessed upon by (termany and came to be regarded as a one nation business. We have read that England might have become the home of dyes had one of her univoratios been disposed to pay a better wage to one or two instructors and had there been a better appreciation of chemical research in the islands This should serve as a warning to our own educational institutions and industries. A few of our scientists have maintained that the volume of husiness in dyes was not maintained tast we voisine in Justices in dyes was not enough to stand splitting up between several countries and on a straight dollars and cents pre-war basis they may be correct but they seem to have forgotten the relation of dyes to other industries which without them would be greatly impeded if indeed they could exist Phose include paints inks textules, leather paper for special purposes and so on

# Why Germany Thought an American Dye Industry

The factors which the Germans believed would make an American dye industry impossible included raw materials, technical organisation lack of export trade and inexperienced selling agencies. There was also a large number—between four and five thousand—of large number—between four and nive thousand—of German patents many of them product patents drawn for the sole purpose of preventing competition in America Then, there was the ever present propagation which was and is much more potent than many suppose. Now practically all those obstacles have been overcome and practically all those observed and the most resistant are gradually giving way. We soon found plenty of many kinds of raw materials and we smile when we recall the solemn assertion often made smile when we recall the solemn assortion often made that the coal tar in America is very different from that in Germany and not at all suited to the needs of the dye business A large number of plants were soon making andiline and the material often surpassed in quality any that had been imported We had always produced large quantities of napsthelene and a satisfactory grade was soon available New that the war is practically over we have a real excess of bensene toluene and xylene at hand It is true that the materials which are raws or ntermediates for the dys industry alone were very hard to get and for a time the extreme uncertainty of the future caused manufacturers to hold back. I'wo such substances are anthracene and carbasol, both used in no

substances are anthracene and carbasol, both used in no other process than dye making and necessary for alizames and rat dyes Some colors are still wanting due to a lack of carbasol of the proper purity

The United States has always done with the scaled heavy demicials so in that direction all is well. It would seem, therefore, that our supply of base materials is adequate with the possible exception of anthracese and carbasol where the question is sow that of sufficient printing. The quantity of raw material is fully adequate

# Building Up a Technical Staff

So far as the technical staff is concerned that too has been developed throughout the works. We have had

too few organic research man m our country, but the dye emergency has quickly increased the number and it has been possible to draw tigas on the chemical industries for various grades of men for the different departments of work and absoratory. The technical and research staffs of our dye plants may truthfully be said to have accomplished no four years what cernany has in nearly twenty notwithstanding the accounts in the literature to serve as quite posts. The properly qualified selfing organization has not been wanting as predicted. Many real Americans had been demonstrating and selling the imported article and they were glad to turn their talmits difficulty has been experienced inthough as doubt the proverbal deficiency of the American salesment in the knowledge of defence of the American salesment in the knowledge of Georgie languages and usstoms is somewhat of a handscap in selling dyes after department of a handscap in selling the more of merican merchandine.

While an export business is highly desirable it is not measured to maintain our dye industry which on do-

we me an export cuantess is nightly desirable it is not necessary to maintain our dye industry which on domestic business at present prices rus hes about \$100 000 000 annually it is, indeed, something to have started with so small a nucleus and within four viers to have been able to export dyes to a value exceeding that of dyes

imported in the year just preceding the war.
Another field in which we have won is that of large scale apparatus and equipment and our present position is one of security for we can I aid highly efficient apparatus for all the unit operations and can carry on most of them on a larger scale that is customary abroad Marked improvements have been made in equipment tending toward efficiencies which will stand us in good stead in world competition

### Fast Colors and Gorman Propaganda

Much has been said about prepagands and we are not yet free from its evil effects. We are still being assured that notwithstanding the retailer a efforts to use the best dyes he can guarantee no colors. In many cases if not all, it will be found that the fastness of the osses u not an at will be found that the Instress of the colors to light and washing have no we been guaranteed and that there is no justification f r the policy originals intended to make it more difficult to introduce American dyes. We now know that the large majority of the imported dyes would not withstand the tests to which our dipe are subjected any better if indeed as well as do the American compounds. One of our largest producers has prepared a large exhibit which clearly proves that point and the many who have examined the display have found ample reason to be proud of our progress and to have confidence in our dyes provi ling they are properly

have confidence in our dyes prove ling they are property used. In order to cover this last point the dye makers stand roady to assist users in the proper application of their product and at least one manufacturers offers service the control of the product and at least one manufacturers offers service the control of the product and at least one manufacturers offers service the control of the co

nees to light and washing now that there is time to work out efficient perification applied to raw materials, inter-mediates and finished dyes. The vat dyes which have been in such demiand are beginning to appear, while the maintaintense, the only colors which withstand bleeching with chlornon, are not out of the laboratory as yet. The work is progressing well, kewever, the experiment misy be carried to the sur all-factory stage nearly say time and following that there was made will be satisfied.

# A Twenty-Year Growth in Five Years

following this car of mands will be skinded.

A Twenty-Yara Growth in Pive Years

'broundy all the could not have been accomplished without adequate families and conspected specialists to operate the plates. All the sow here yet and the could not have been accomplished without adequate families and conspected specialists to operate the plates. All the saw fin pool shape. Out to their lines, improved the quality of sheft product, to their lines, improved the quality of sheft product, rebuilt their planes and man the factory oil at the case time in a dial admittedly the most complete in chemistry. Perhaps it can all be put in one sentence and made strong for those who measure thangs by a German standard, whime for the days when they may have (ierman dyes again, by aring that in some fave years our in America have done as previously, changing our country from the mapor't to the export doulma at a time whom most factors were adverse.

The present status of the dye industry is, therefore, that we have acquired the plast, the personnel and the technical experience. Proper selling and demonstrating organizations have been creased. A large amount of export business have been creased. A large amount of export business have been or the an American dye industry impossible have been overcome. Rosearch laboratories, are working out many new things and when these are ready they will be taken to the sema-commercial scale of production where the creases that normally appear when work begins on twenty-five or one hundred pound lots are worked out. It always pays to make mistakes on a small scale and successed on a larger one. While the scale of the competition of German product them-selves through the competition of German product them-selves through the competition of German product them-selves. These patents, therefore, have become a halp when the competition of German product them-selves t

Many will point to the invested capital of several Many will point to the invested capital of several hundred million and our last complete statutes and declare that the industry can care for itself In 1917 190 firms manufactured coal are formicals, 1918 concerns produced intermediates and 81 establishments emgaged in the manufacture of dyes, many making but small quantities for their own use. Now was dangers beset

### Present Condition of Garman Ple

Major T. Well has investigated the German States and reports them in escallarly suchable networkshemating numerous reports them in escallarly suchable networkshemating numerous reports that they had been damed and reports them in the him of the second raids, see Some of the mans president works trace for first the size and six trained technical states were likewise predected by the prevent elastification regeate which, based on a mast's elikity to the country, conserved this grade of labor from him size of the formany stands randy today with sizes, wall ordered plants, organisation and skilled weeknes ready to glacing into the world's markets and try to writ alson hands us the surface of the second country of the stands of the second country of the stands of the second country of the pure of the second country of the year. The second country of they will Then these is the qualitation of cornain control of they will Then these is the qualitation of cornain control of corriets plants in other leads as the country of most country with the second country of the property of the second country of the pure of the second country of the second country of the pure of the second country o

Can not a competition with all was experience.

Thus there as the competition of friendly countries und as Great Bristian when the Geverance the factor much as Great Bristian when the Geverance these factors are too American Geverancest and has size and of size experience of the Competition of the

PING dop with the davel The set versit in seeds tope its service four forest three tendent in gil and heat o wing spenal of three tendent in its annual control with a service for the tendent in the tendent with the service three propositors, in interest and one at the reas, which is the tendent of which the high is in display with the high in the service with the adoption requires to self, and distributed and the service of the service with the service of the servi

past pintry of new meeters into the conservate pressipasting of life fifting

German Stationaries Ery, Brack, and Teaching Tamic.

AT the north and of the Keel Canal an Allied ComAn dissions from the submarine dry dock and tealing
and which is howevish Huntrade It represents a type
which is quest, with wardons modifications, by other nevel
powers, sain, as for as our information, good, the first to
design said build saystines of this jund was the Utalians
In our marie of fifty bio, 1644, to other
an learn interesting sent of about 8,000 tons,
topable of a speed of 14 knots, which
careful methods and the said of the said
which a deameter of 22 feet

The German tamic is mounted upon a
modified form of induced in cross-sentor
with a hearing-barried from the At the
other and is a pate, strough which, after
the tamic has been submerped, the submarine enters and is mesured in place
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the tamic has been submerped, the submarine enters and is mesured in place
the tamic has been submerped, the submarine enters and is nessered in place
the tamic and quit of water in which they
are intended to oppresse
Before the war our boats were demand

to or greace, the maximum depth of wave-are intended to operate Before the war our best were designed to withstand a presence corresponding to the surface of the sea. We believe that during the war the expective of the sea. We believe that during the war the expective of the sea. We believe that during the war the expective of the sea. We believe that during the war the expective of the sea. We believe that during the war the support of the sea.

of the see. We helieve that during the war the expectity for deep subnergence was because of The advantage or was because of The advantage of constructed subnature to tested to exercise it is a maintandory as to strength and water tightness, it is a maintandory as to strength and water tightness, and the second to the construction of the second to the construction of the second to see of there has been any deterioration in these the second to set of there has been any deterioration in these theoretics.

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way to be brill of great strength to withmand the great part to what they are
should be all 200 fact of depth this
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is global and the heavy and
samely spaced depute ribbing which shows

# How Poless Gases Shrink Leather

How France of a leather cost, we have this to sky! because of being accepts in a scon par sitted. That expensive leather special which assens on impervance to have any take on the appearance of a ten-dollar this to me, you stitude, you sell which seems so improve which seems so improve the supercrass at after a relation, if serials poissesses



Two views of an abplane hije which climbs to high altitudes and files standily in mederate winds

to this kid glove might well happen to other letther articles coming in contact with the particular gas em-ployed by the Germans on that day

# Measuring Fluid Velocities with a Hot Wire

THE measurement of the vilocity of currents of air and other game is a fail of applied arenos which has power been on a wholly gatisfactory beas. With the Pitot sube and the tiking water page it has been oustom any to measure the effective bear that been oustom any to measure the effective between the state and



Took for resisting and testing German U-beats

dynamic heads, and that difference is roughly proportional to the square of the velocity. But the technique of the test of the test of the test is not which quantor with any degree of confidence he extraorded to the hands of a workman unablide m file arcention, and in addition there is a given question as is [not how sometime the determinations are under contain streamed-senses.

much require which has been tried our much require is that the velocity of a be measured by observing the rapidity

with which it cools a hot wire. The fundamental basis of this suggestion as olivously a sound one, the time which it takes the stream t bring the wire dwn from let us say 400 degrees to 300 as certainly a function of the velocity among other things. If we have the same the in be sure of always having the gas t the proper density and temp rature at the proper density and temp rature at that the ap the heats involved shall in this trust beyond our ability to keep track of them and if we can r gulite with som incasure if accurity ment leaving only the velecity free, we shall have an effective means of ermining the latter

# Plating Iron with Copper Auto-matically

PLATING from with on per has received much attention from practical and sesentife men but sade from the deposit secured by unnersuon of ron in copper sails by electroplating or by widding text for this sheets of ron and copper these efforts have met with no autoess says as Ann rean metallurguleal authority. Such see for ron and copper these efforts have met with no autoess says as and in real metallurguleal authority. Such see the conditions much an extensive the production of copper-plackd ron in most if not quite all of them a bath of motion copper has het; used. The temperature of a multice copier beer

of The temperature of a multen copper bath is so high that the iron oxidizes before hath me high that the aren conduces before text an be immersed in the molitae copper-uals as protective flux for the molitae copper as used its surface will also become outland and in any event the plated new will outlas, immediately on its being with drawn frum the moliter bath. A company at lizabed in N iron alocels with copper by a new process. The plating mutual is applied to the size of the the form of a soft natural by year the con-sume as in as unknown to the con-

such as inking rolls. In short after bring coated with this mixture is automatically carried forward and deposited on a link belt conveyor which carries it through a furnace maniformed at a tunper sture will above that of molten capper. The basis principle involved in this method has in the application of the plating metal to the short which the heat is cold and then melting the metal in place on the absert months which the short is cold and the melting the metal in place on the absert months which are fav viable to the formation of the plating.

WHAT severally a large sacd vacuum cleaner has been delivered to a concern in New York (it y that specialism in cleaning as him of public buildings and large readeners and while the apparatian is experimental because it is not hear to desire the wind of the designer feel sure it will prove to be not only practical and efficient but will never the contract of the provent of the pinoral public by minimizing the disconforts and the contract of the pinoral disconforts and an extended the pinoral disconforts and public by minimizing the disconforts and public by minimizing the disconforts and public by minimizing the classified gradual reasons of dumping the filled galaxies. The companied iron containers into open eart blocks:

The companies are not a containers and the population of the provided provided the provided provided provided the provided pr

books:

The cupment is mounted on a five-ton
theses and is a large box compariment,
res milling the conventional vian the doors
and gates of which can be closed tightly
ton the chasses is mounted a lidower that is
driven by the engine and the is so adapted
that sakes are driven into the compariment
from the sah pit no matter what the sagis,
through a telecoroum great tube. The
truck is driven is the carb at the mearest
point tot it and pit and the tubes sectanded
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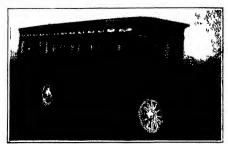


o of an other ulter being exhibited to German prisonous guess, and

# The Motor-Driven Commercial Vehicle

Conducted by MAJOR WICTOR W PAGE M. S. A. E.

This department is deviced to the intrests of prisont and prospective conners of motor trucks and eletery vagons. The editor will endeavor to answer any jet lift of mechanical festures operation in it management of commercial motor valueles.





The mobile restaurant belonging to the New York Police Department

## Travelling Restaurant for Police

THE work of the police during large relebrations is marked by actual physical discomfort because of the long riod of luty without any apportunity of receiving refreshments it is not possi ble for them to secure relief or it ave their post because all available men are uti

A feature of a recent military parade in New York was the appearance of the New Yark was the appearance of the police department a now travelling restaut rant, which per clied the paradic by over an hour and distributed sandwiches office and applies to the wounded soldiers and to police officers on duty along the street. The truck worked from 6.30 A M until late at might under the direction of a lentenant and five police. men and distributed 18 000 sandwiches The appearance of this restaurant truck was due entirely to the gentrosity if Deputy Police Commissioner John A Harriss who not only donated the refreshments but presented the truck to the police department as well Dr Harriss has always been keenly alive to the discomfort suffered by patrolmen under holiday conditions and during seven weather when their regular hours are considerably lengthened and their meals few and far between

With a view of bettering these con ditions he ordered a three-ton truck upon which chassis was mounted a complete lunch wagon—body 21 feet long and 7 feet wide I his is completely equipped as a travelling restaurant as the accompanying illustrations show having a coffice machine

meals under all conditions There ar 20 seats inside and m cold weather the interior may be heated by radiators connected with the exhaust mantfold

### New Track-Laying Tractor

NIW and self laying A NIW and self laying track type of farit tractor design 1 by C. H. Martin of Springfield Mass. is shown in the a ninying illus-tration illustrating be castase it incorporates novel features f construction
The tractor s the outcome of experimental work which the inventor did is cooperation with the Ordnance Dopartment at Washington, D C The tread is made entirely of pressed steel which means light weight and great strength and that material is also used liberally in the construction of the track supporting rollers track drive sprockets



Track-laying tractor made of pressed steel interchangeable parts

the conventional motor truck construct tion and eliminates many of the crudities usually found on this type of machine The tractor is designed to pull three plows and the design permits of ready manufacture by economical and progressive auto construction principles

r ad building This wide rim steel wheal s design d primarily for use in road con-struction because it has been found that motor trucks used in this work are ren-

Steel Wheels for Truck Conversion

CONVERTING the standard automobile truck into an efficient combina-tion road roller and motor truck has

d red more efficient when equipped with 1 rad runmed traction and supporting members which enable them to run over



Road-building truck fitted with cast steel wheels

One of the reer wheels

the soft ground sand, gravel, and trushed stone surfaces encountered in building roads without sinking in

roads without sinking m. The motor truck thus equipped does double duty, adding a substantial effort coward the finaled pole every time it hauls a lead of material. The constant retent with a seasy motor vehicle loaded with road building material (a five-time truck with a capacity lead weigh approximately 10 tons) sessies in firmly retent to the constant of the co trucks is built for any make of mass drive ohan, internal gasar or worm, and is essily and quickly interchangeable with ordinary motor truck wheels Truck manufacturers are offering these which sare to be used in good roads which are to be used in good roads which are to be used in good roads construction and as extra sequipment to contractors who require service of their trucks in several different lines of work. The scrompanying photographs will give a good idea of the appearance of a stan-dard truck with the new wheels attached in place of the conventional rubber tired members.

### Why War Trucks Will Not Flood the Market

MOS1 trucks used for the transporta-tion of men and materials abroad dur-ing the war will not find their way back market, reports a former member into the market, reports a former member of the 102d Engineers, recently returned from France There are two main reasons why this is so One is that the transportation problem is equally as difficult now as it was when the was reaching its oliman. The

other is that the trucks have been subjected to such hard been subjected to such hard usage that they are junk when discarded When units employing trusks are broken up and returned home all moter transports are turned over to a base or depot Those that can be repaired are overhauled and kept in service by being assigned to active units, but many trucks are serapped without even being taken to a salvage dump because their restoration is not considered worth while,

These worn-out trucks will have to be replaced by new triacks and it is doubtful (Constant on page 676)



# Good highways should be continuous!

We should have continuous highways available the year 'round

Traffic should continue to operate in winter as well as in summer

Economic development demands this

Mr Roy O Chapin, Chairman of the Highways Transport Committee, says

These main highways must be brought into a comprehensive system—patterned as the rail roads have patterned their systems string to connect population and shipping centers with regions of natural resources—agricultural mineral, etc. Permanent surfaced highways must be built and maintained sufficient to with stand the strain, and carry the traffic of the future."

Of what use to National highways transportation are certain good sections of road, if some communities persist in their neglect to improve and properly maintain the connecting links?

The facilities for motor car and truck transportation are already far ahead of the roads This neglect of road improve ment, therefore, is putting obstacles in the path of rapid national economic develop

The one economical method of making and maintaining highways is Tarvia macadam construction

Plain water-bound macadam is no longer strong enough for heavy traffic highways but Tarvia-macadam will stand the wear and tear of speeding automobiles and giant motor trucks

The initial cost of a laivia road is a little more than that of ordinary water bound macadam but the great saving on maintenance more than offsets the difference in first cost. Indeed many communities are now using Tarvia on all their principal toads to save money.

Communities that already have plain mknadam roads that are beginning to show wear will find that a prompt surface application of the appropriate grade of farvia will aircst their deterioration and greatly prolong their life, and at much less expense than by any other method



# Recently Patented Inventions

Brief Descriptions of Recently Potented Mechanical and Electrical Dusties, Tuels, Form Implements, Etc.

INCLINOMETER FOR AIRPIANES—G W FARTHING 537 latton at Dry Fork Va Among the objects of this invention is to provide an in linometer adapted to be mounted in th hood or cowl of an airpia of the inclinemeter in luding a plumb ring pivotally mounted and adapted to always remain stationary the and support of always trained successive to it fix the bottered by the plumi-cing and a corresponding pointer back of the ing indicating the amount of lateral deviation fitts planes from the horizontal

AIRPLANE —P C SURRERS 122 Second St Ogden I tab The object of the invention is to utilize as an assistance in the pr judeion as well as stability of the machine eriain air currents d v loped in its normal operation. More par



A VERTICAL TRANSVERSE SECTION SHOWING

shle wind vane in connection with an airplanewing and adjustable at a point where the air current directed forwardly over the oran extremity of the wing will engage the vane and assist in the pro-prision of the machine and the stability thereof without increasing the normal wind resistance

INCIDNATION INDICATOR -W H Nat son Norwood Colo The object of the invention is to provide a device designed for use with flying machines to indicate the inclination of the ma-



prices an annular hollow transparent ring having prace an annuar notice with respect to the partitions located at diametrically opposite points and dividing the interior of the ring into two compartments a ball mounted to roll in each compartment and a scale in connection with the ring for indicating the position of each ball

siming to Appe

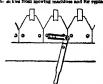
GARMENT HANGER —H E WILLIAMS 120
Broad St Red Bank N J The object of this
invention is to provide a hook for hanging gar
ments for holding separately a hat, cost and



trousers, and thereby capable of economising closet room. The hook is provided with means

RECEIVING INSTRUMENT FOR WIRE-LESS SIGNALING A Agrow Turin Italy This invention consists in receiving appliances or devices for wireless signaling or the like whereix the movable colls are traversed not by oscillatory the moveon colar are reversed not by osculatory but by resulted ourseas from the directive aerial conductors of a station designed for receiving signals from several directions. In magnetic action on the movable colls is produced by a powerful persuantent magnetic or electro-magnet. The colls are desposed vertically and are free to sum around a vertical axis.

SIGKLE PULLEE — 6 D Russials, cost
Odcasa Farm Winfield Rass The object of
lits invention is to provide a device of the sharacter specified especially adapted for removing
the sk kins from moving machines and for replac-



A TOP PLAN VIEW OF A PORTION OF SICKLE BAS SKOWING TOOL IN USE

ing them wherein means is provided for per-mitting the removal or replacement of the sightle without the necessity of handling the same said from the rear of the sickle bar

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DOUBLE KRYBOURE PREVENTER—W
H TOURSETS REPORTED THE CHEMPINER
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MILLIANES TO SPEARY DEVICE—MI PILLIANES TO SPEARY DEVICE—MI PILLIANES TO SPEARY DEVICE ME TO SPEAR Invention has particular reference for the control of the chaptarga has trumines such as featbern or the like Amons the objects of the invention is to revisible a holder which may partake of the countrol of the control of the country of the countrol of the country of the country of the countrol of the country of the country of the means for suitably holding individual millinery has an experience of the country of the country of the part of the country of the country of the country of the part of the country of the co

CATCH FOR BELTS -S B G CATCH FOR BELTS—4 B GIRDLER, care standard or the investion is to provide a quick the objects of the investion is to provide a quick exchapt each which will not restlip become dis exchapt each which his extremely strong both in general makewhich is extremely strong both in general makewhich in the strong both in general makewhich is extremely strong both in general makewhich in general makewhich in the strong both in general makewhich is extremely strong both in general makewhich in general m

quickly released when desired #FIRE EXTINUIGHERE -D E Mrm. 1288 Franklin Ave Bronz N Y The object of the invention is to provide a recognized disposed within an outer receptacle and containing an expelling field under pressure The capilling that make the containing and to the spece between this income stated and flower to the spece between this income containing and the class to the cuttle in the outer recognized. A further object is to provide a fire extinguishes from which may be dicharged a portion of its contents without ecclusivering the operativesses the extinguishes at a considerable possed them-

BOAT CHOOK -F O JORNSON care Anderson and Setters Attays Astoria Ore The object of this invention is to provide a boat chock which is adapted to facilitate the insertion and smooral or ropes The invention may be arranged in open and closed position. The chook



A LONGITUDINAL VERTICAL MECTION OF CHOCH

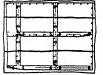
consists of a casting comprising upwardy projecting invaridy curved arms located at the opposite ends of the chook and apsord apart. Between the opposite ends extremities of three-ferms in a member rotatable on a vertical aris having leading and projecting arms mease is provided for locking the rotatable member in piles.

PROCESS OF MARING ARTIFICIAL DENTURES AND DOCULUTING FORM FOR THE RAME. OF WALK, East old Brondells will be a few and the state of the

will be insured SPOIL DELIDITOR APPARATUS POR PAC-TORY MACHINES—— BRARDVIER, 380 E 50h W. New YORK N.Y. Associate the principals of the properties of the properties of the previous tampeting with thread supplied to war us merhandes for factories where thread is employed to facilitate the keeping of stock soon its and particularly of the sents of the prevent the purching of thread to mechanical prevent the purching of thread by mechanical to the prevent the purching of thread by mechanical ing the same

METALLURGICAL PROCESS -- O M METALLITETICAL PROCESSES—O MANAGEMENT AND ANAGEMENT ANAGEM exidation is converted into soluble make which can be easily precipitated from the solvent

WATERPROOF SEAM FOR COMPO SITION BOARD—A G PAFFRIRA SEAR, 512 Woodward Ave Portland Ore. This investion relates to a waterproof join for composition and other boards whereby the same can be used for



roofs walls and other exterior work the principal object is to provide an overlapping flexible seem folier of simple and inexpensive construction and of designed that the boards can be easily and quickly laid and the waterlights joint secured

Mechane and Monhadeal Impleas

MOLIANE BRAINIOS—W D. STURN,

Amenia N. Y. The princers object of the

vertical is to provide a bearing the volume being

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siding riction between the rollers is similarated with rection between the rollers De Quêncy. La like invention relates more particularly to a means to form a servise joins such the the pipe may be turned about its act. The general object is provide a service joint whereby a find-right connection is insured and the packing of the joint may be removed on a write of the pipe may be removed on a peak loss of the pipe may be removed on a peak loss on the pipe of the pipe in the pipe of the pipe is pipe in the pipe of the pipe in the pipe in the pipe is pipe in the pip

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above search type may be produced.

hore general type may be preduced.

Rathways mad Thethe Asiammentics of IRAKE HANGER—L. E Kurtz St. Carle Go. Co. St. Louis Mc. The knowning, reliefs to the brakes mechanism of rathway our greates, to object in to provide a brain hanger arrange, the object in to provide a brain hanger arrangement of the brakes shows an all times fit, count allowment with the car wheals to prevent amount on the convenience of the contract with the car wheals to prevent amount on.

### Portshilds to Bears

PUZELE —F A McCasm, Bisiologic The investion relates to a single and in-puzzle. The object of the investion is vision of a puzzle consisting of an appeara



A PLAN YERW OF THE PURSUE

may be readily carried upon the person, whiteout inconvenience, and the solution of which may preceed from time to time for instance, at append interrals, without endangering the loss at any

VEHICLE SEAT ATTACHMENT.—W A Dalone Ja 1 Medisso Ave / Polenfield, N J Among the principal objects which the haymante has in view artendaby the sents of an accompan-ted particularly the rear east of a nonman to be and particularly the rear each of a comman to be quickly changed for me by one person, and to provide a structure with adjustable arm and shoulder rosts for supporting passengers in de-sired picking position. The device comprises more able supports for dividing the secting space of a custom and means for locking the supports in Sulunted position.

SHAMER SHAND—E J Les and E H Pressurer Blacker Barb The Systemion relations made as a care the second by the System Shaker Barb Shamer Blacker Barb Shamer S

AUTO TRUCK DUMP --P Hunermott, 200 Boston Bidg Manaspols, Minn The invention has for its object to provide a device for use in connection with dump weighing coles for lifting the front end of a motor truck to dump the lead

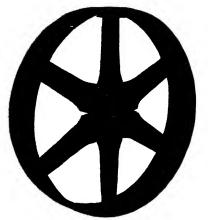


through the reer end, and so erranged that the lifting mechanism will not interfers with the picture weighting of the lood, that is, in lift the front wheals of the cruck while is in on the dramp, with the dump in hericantel postion.

# DESIGN FOR A BAND BAG FRAME.—Q onymon, 103 Pulses St. Nov York, N Y

We wish to estimate to the fact that we see all a particular to conform variances for particular to conform variances for receiver in the particular to conform variances for receiver insulied a postessor conformation of mentional and extension and consistent expensions. Association in the control of the conformation of the conformation of the conformation of the particular of the particular of the conformation of the confo

# DODGE





# The New Keystone Steel Pulley



The grooveless, evel erows of Keyetene Seel Pulleys presents a smooth, uninterrupted surface to which belt searchly conforms. The Keyetone,

Keystone rivets never sheer. Whenever rivets are used in Keystone Seel Pulleys, the metals are countersumb. This protests the rivets from all shearing strain.





The cond-soil had of Majoraba Pallinys has interception. These contents in horselessy or this point on the copies out on layout total rise to half. The common of the high in South Stars in those at those on market on Majoraba to Thompson before are analyTHIS new steel pulley was born of wide experience in steel pulley design and manufacture, and proved by actual service under the most strenuous operating conditions. It will make good for you.

Here are a few special features that insure its long life and low operating cost:

The Rim—Made from steel 3-16° or 1-4° thick, so solid and substantial that it needs no beads. Rim Edges faced in a lathe to insure balance and true running. The face is a grooveless oval which affords 100% effective belt contact (See illustration at left).

The Arms—Extra strong and wind cutting, offer minimum air resistance.

The Hub—Interwoven with the arms affording the greatest possible strength. All sizes over 16" diameter reinforced by malleable iron yokes. The new Keystone, when properly tightened, will not slip on the shaft.

Rivets protected from shearing strain—wherever shearing strain could occur on Keystone rivets the metals are countersunk. This positively prevents sheared rivets.

This new steel pulley has all the advantages of other steel pulleys—and a few of its own.

Order one from your dealer. We'll guarantee it.

# Dodge Sales and Engineering Company

Distributor of the Products of Dodge Manufacturing Company and Dodge Steel Pulley Corporation

General Officer: Mishawaka, Ind.

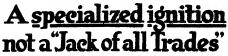
Works: Mishawaka, and Oneida, N.Y.

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NEW YORK
SI Murray Street
ATLANTA
20 S Ponyth Street
PROVIDENCE, R
177 Place Street

CHICAGO
206 B Clinton Street
PITTEBURGH
207 Second Avenue
SEATLE

ST LOUIS 608 N Fourth Street MINNEAPOLIS 100 N Third Street



A magneto creates its own electric current—it does not rely upon an uncertain source of current for its dependability—

It doesn't have to feed six lamps and a gourmandizing starting motor—

It is a self-contained, responsible, simple mechanism that specializes on just one thing—creating current for ignition.

Be sure your new car is equipped with a SPLITDORF Magneto. Then, whether you forget to nurse the overworked battery or not, you will always be able to get dependable ignition performance for the engine.



### The Friendly War After the Wer (Continued from pass 652)

and etherwise acting as orthodox advertis-ing agent. It is worth noting, by the way, that those in whose hands has been placed the actual workings of the Industrial Publictty Service were selected with unusual care. They are all men of big caliber and

are paid in proportion

The supreme importance of an adequate foreign press service as viewed by the Federation, is set forth in a report sub mitted by its Overseas Main Committee

other things, the report states
'Your Committee urge that propa-'Your Committee urge that propa-gands and publicity matter are of special urgency at the present juncture for the following reasons '(1) The closing down of the British Ministry of Information at a time when the

governments of other countries allied and neutral, have embarked on an intensified propagands in overseas markets
(2) The great activity of foreign and

olicity agents
(3) The general lack of intelligent or

adequate propagands on behalf of British industry and commerce in the press of foreign markets even when that press is substantially or mainly supported by revenue from the advertisements of British

The man retained to control the foreign press propaganda is peculiarly well fitted for his task, having been for many yoars at the head of one of the largest advertising agencies in Great Britain. His stuff is agencies in Great Britain. His staff is being actively recruited and the preparation of live news matter is at present in

It is felt by the Perioration that eventually the funds accruing from the Publicity Service in its capacity as advertising agent will amply maintain its press service and that these funds are more likely to increase than to diminish with the passing of the

Viewed by and large in confining its definite action mainly to the sphere of publicity in its various forms the I eder ation seems to have taken the only cour that is both practical and impartial Di-rectly to subsidize, or in any other way to foster the interests of any one industry or group of industries could not ride ind to the advantage of British industry as a

whole it is quite clear that the Federation the most powerful trade organization Cruat the Britain has even known is prepared to fight is Britain has even known is prepared to fight is 111 and her debt is 3.50 per capita would be considered to was have been anticipated and success ceases have been antempated and success [121] with a debt per capits of 3600 Association of Manufacturers in other cases the chief departure from precedent us in the comprehensiveness and thorough-which (when the comprehensiveness and thorough-which (wirmsp) will have to pay and which the most of the measures taken a X apy rate in turn will lighten the burdens of the other capits. Association of Manufacturors in other cases the chird departure from precedent is in the comprehensiveness and their other is manufacturers, who are not accustomed to shrink from competition unless it be fostered by government subsidy or be otherwise unfair need and heattate to take up the gamder. It is sometimed to the competition of nance in the world's work and that the western hemisphere will earn its full share of the fruits of this work

# Monetary Cost of the War

in New York, which race 284 feet from the

Standing beside this tower of debt hive shown a block of gold measuring 43 8 feet on a side which represents 20 billion dellars or an estimated total of the supply of gold in the world (if course the real significance of a debt is not measured by its total but by the per capita burden and its relation to the meomi per capita of the nation. For this reason we have shown a conventional figure representing a citizen in each of the five countries involved. The wealth of the chirted states is estimated at 300 billion dollars and dividing this among a population of 107 million we have a per capita wealth of \$2.803 The debt of 30 billion dollars divided among the same population represents a burden of \$280 on each individual and so the conventional figure of the American estisen is sh with a bucket which if full would hold \$2 803 but which has been emptied to the extent of \$280 while in the bottom of the bucket there is a leak from which is drip ping \$11.68 representing the per capite interest on our national debt

Great Britain is somewhat in the same condition as the United States in the fact that a certain portion of her debt, about billion dollars, will be paid back by her allies and dominions so that eventually her debt of 36 billion dollars should be reduced to 31 billion dollars but as this has not yet been repaid we have retained the total debt of 36 billion dollars in our the new control of the per capita indebtedness. The per capita wealth of Great Britain is \$2.600 and her debt per capita \$782 and the interest on the dubt per capita comes to \$34 24

France with the same dobt as that of Great Britain has a much bigger load to carry because her wealth is not so great and her population is smaller. In estimating the weather of France the calculation is complicated because France suffered heavy losses of property in the war. On the other hand Alsace-Lorraine has been added to I rance and the wealth and income of these provinces must enter inte the calculation Taking all these factors into consideration, the national wealth of France is placed at 90 billion dollars so that her per capita wealth is estimated at \$2.250 with a per capita debt of \$900 and with interest on the debt of \$45. The burden of France therefore is exceed

nations

The situation is tabulated by Mr Fish as follows, the figures for United States having been amended by us as explained

| Inited States<br>Freat Britain<br>France<br>taly<br>Jermany                                                                                                                             |                                                             | 880<br>86<br>85<br>13 6 | 90 | 10<br>80<br>40<br>31     | 8 | 1 8                                  | 001 1      | 5 6<br>5 0<br>7 8 | 10                               | 88888 |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-------------------------|----|--------------------------|---|--------------------------------------|------------|-------------------|----------------------------------|-------|------|
| (Dobt wealth interest as d income in bilines)  BUTS AND INTEREST CHARGE COMPARED WITH BOSS- MAYED WEALTH AND HOLONG OF PRES PARTICULAR BULLIGERIMES IN THE LATE WAR PARE CAPTER A BASIS |                                                             |                         |    |                          |   |                                      |            |                   |                                  |       |      |
| 5                                                                                                                                                                                       | Pertin                                                      |                         |    | L.                       |   | ı                                    | Interest   | Contract          | 1                                | -     | 20.7 |
| £3533                                                                                                                                                                                   | United States<br>Great Britain<br>France<br>Laby<br>Germany |                         |    | 788<br>908<br>880<br>600 |   | 1808<br>9808<br>9860<br>1111<br>1861 | #1.6.2.1.E | 82828             | 31<br>31<br>31<br>31<br>31<br>31 | 070   |      |

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Science in the War (Constant from page 549)

12 24 hours as much as a complete metals in a week. The work of the Bureau in metalsizing the second of the sec in light and optical instruments the Bureau conducted, for war purposes, researches in the development and im-provement of photographic plates, color measurements and specifications of color standards color transmission of dyes and other materials precise measurement by the use of interference franges, design and

other materials process measurement by the contemporary of the con

inaccurate One cannot match up exactly two lnes, however fine they may be, and however nearly the same thickness. There is bound to be some error, which may be as much as 40 merons (one meron equals 1/25,460 meh)

The Hoke system substitutes end measurement for this line measurement. This surement for this line measurement. This is inhereatly more accurate, two bars, wring to a someon base, can be compared for length, susskanically, with an accuracy that goes far beyond this figure. So if interference neethods, with an abstracy that goes far beyond this figure. So if his investion leads to the general replacement of the line measurement by the end measurement, in connection with lengths and thicknesses, Major Hoke will be well pleased. ploseed

# The Propent Status of Our Dye Industry

(Continued from page 860)

war must necessarily have a great influence of manufacturing for peace purposes 50 that while it is true that much otderwise measurement from peace 800 that while it is true that much otderwise measurement will be more and the government was recomment with the more peace and the proposed of the more peace and the more and the work. The dye men have said the war it is also true that the knowledge thus gamed and either now or eventually in he made public will be of the greatest benefit not only to the United States, but the world at large

The American Precision Block (Continued from peace 818) what amounted to a challenge it was increasing four to develop some measure of more reput and far more measurements and the method of the interferometer, which deals with millionath of an inch, but certainty far more rapid and far more nearly self-out this demand will be the solice of another contrained will be another that the measuring distinction. The solice is another than the measurement of the solice of the

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WASHINGTON OFFICE

### The Present Status of Our Dye Industry

of from page 662) Construct from page 889)
been and that the money invested in dye
research in Germany has been the best
investment in the world's history. It is
the second time colors have helped make
a nation strong. The first instance in
histry goes back to the days of Tyre and
(arthage when those walled cities owed
discovered to the control of Tyrean nursies. (arthage when those walled titles owed their wealth and power to Tynan purple, a dy, stuff obtained from a small snall-like shell fish the identity of which has been established from the piles of shells remain-ing. The dye stuff itself has been dupliing The dys stuff itself has been dupli-cated synthetically and is a form of di-brom medge inferior to that now made so successfully in Michigan A dye industry will also attengthen us but it is not full grown and nood our support. A foregared being saked for his with the considered America agreement with the considered America agreement successfully and the con-takt the will for the deed Knowing that we have the resources and ability to actake the will for the deed innowing that we have the resources and ability to accomplish something we have decided to i we are a little inclined forthwith to call i we are a little inclined fortunit to call it done. There is that danger in the dye situation and while its present status is surely satisfactory and highly encouraging their remains much that the public itself

# 1 1st do if we are to make it strong enough Why War Trucks Will Not Flood the Market

(Continued from page 862)

if the number of trucks now contracted for will be sufficient to take care of present needs the railroad system of France even including the temporary military railways was and still is hopelessly in al quate and motor transports were verladed and driven at excessive rates f at ed over roads that had been worn

r uned by bombardment

The command of hostilities has not 1h coestion of boathities has not riv li transportation difficulties Troops rust be fed and elothed, and the large movements of troops still taking place in France add to rather than leasen the demand for transportation. The feding of the Central Empires and new states also adds gratly to the burden of transportation for they as well as the Milke are short of transportation. How the return of the refugees to the invastation reconst where railroads have

icvastated regions where railroads have en distroyed and nearly all roads have ten bedly damaged by shell fire, requires an enormous amount of motor transporta-tion These people require supplies of all kinds in addition to clothing and

food with which to rebuild or restore their ruined property I actories stores homes and even farms must be rebuilt and until the entire war ruined area is restored there will be but little lessening of the tramendous demand for trucks, and the severe work performed during the restoration period will surely cause such depreciation that trucks that were in good condition at the close of hostilities will be of little value when the first rush of the reconstruction period is over. In fact, there will be a large market for new trucks to replace those worn out in such

### The New Zmoonium Steel

Sibbl containing screenium promises to play an important role in the future metallurgy of the steel industry, says is demic (wil Here again the war has been Genic (but here again the war has been the immediate cause of the development of the use of this element. Mystery, at least so far as published data are concerned, surrounds the results that have been attained in the United States from putting successive improvaments of weapons and arrownium into various steels. There have tools of stone, bose, horn, lovery and wood, been rumors in circulation about the strik- until the final retirect of the top probable that nothing Christ Inspite of the remarkable progress very definite than here ascertised up to which he make during what we call the their the transition was signed. The Paincollithic Age, it is evident that other ascertised up to which he make during what we call the their difficulty had evidently been, and general progress had been restarded as call is, the production of a uniform terro-

simmaken, one containing definite measures of the sectal and correspondingly regular simousts of other may represent or the stemace of the sectal and correspondingly regular simousts of other may represent the sectal section of the section of

be credited with bestowing the unusual properties we are not told. The value of both manganese and silicon is already ap-preciated. It is a high manganese content precisted It as high manganese content shore that has made possible the produc-tion of cast steel chain in this country having properties superior to say chain heretofore made It is probable, however, that in the same manner that vanadium makes steel santi-fatigue, so sirconnum increases to a remarkable degree the tough-

Considerable concern is reported to Considerable consern is reported to exist as to the future supply of vanadum it is and that present resources are being rapidly exhausted and that it may be necessary to find a substitute for vanadum it is shoped that this may not be necessary for the value of vanadum has been emmonity demonstrated 8 bould the rumors turn out to be true, it may develop that other substitutions of the contraction of the contra that either sirconium or even titanium may take vanadium s place to a greater or may take vanasum s pases to a grosses or less degree Already the interest in titanium as an alloy in steel has been so active that unusual results are heard of as to its value as an alloy in steels

to its value as an alloy in steels It seems certain that we are on the eve of most interesting developments in the real mof alloy steals containing the rare metals. It is probable that the interesting results obtaining by the British in the evolution of their tank armor should be credited to steels containing sirronium, molybdenum and perhaps vanadium and the steels.

# A Recently Written Chapter of Remote History

THOSE of us who are old enough to have been brought up under the old school of history know well that the outlook upon of hattory knew well that the outlook upon any Egypt and Mecopotamus has changed greatly disce the day when pre-Grecian history consisted manuly of the deceds of Ninus and Semirania, with a description of the Commission of the deceds of the Commission of Science in Washington, Professor Breasted of the University of Chacogo, America's foremost Egyptologists, gave an outline of early Nills history which is most illumanting in this connection of the Commission 
According to Dr Breasted, after several hundred thousand years of the discernible human career, the sevage European hunter of the Ice Age had slowly advanced through



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### A Recently Written Chapter of Remote History

(Continued from page 670)

contrasted with his contemporaries on the south side of the Mediterranean in northern Africa The retarding force was evidently the cold and ice of glamal Europe

the cold and ice of glacust Europe Unaffected by any such retarding ob-stactes the Stone Age hunters of the Sahara then well-watered and fertile, were gradu-ally alle to shift from the Sahara plateau down into a great north and south rift in northeastern Africa, dating from Pleiocene times whi h we now call Egypt. It was then a lake but as the drainage of inner then a lake but as the dramage of man-ferea fund its way into this rift and through it into the Moditerranean, this long marrow, early Plestocent lake became the i wer Nile valley. As the alluvium be<sub>san</sub> to collect on the bottom of the old lake the bahara hunters took possession of a fertila and sheltered valley, so gener of a fertile and sheltered valley, so gener ously supplied by nature and in climate so bengen that already in quaternary times, the Palcolithic Nile-dwellers outstripped Furope and left it far behind in the advance toward civilization

While the Palaeolithic remains of the

eurly Nile hunters are found in great quan-tities, especially in the form of stone weapons lying on the Sahara plateau above wapons lyng on the Sahara plateau above the race and along the surface as well as in the lacustrine and fluvatule terraces, the earliest stages of advance on the alluvium (arth deposted by rivers), the stages by which the northeast African hunters were transfermed into settled communities, practicing agriculture and cattle-breeding, the stage of the stag are buried deep under the upper alluvium whi has accumulated since quaternary tin is for the lower alluvium of the Nile valley was deposited far back in Pleutic-cine times when Europe was still beset with the last descent of the ice

In the carliest cemeteries and graves dug int the rww terrace, just outside the mar-gin of the alluvium we hind the prehistoric Lyptians almost past the Neolithis stage and already in possession of the funda-naritals which were steadily earrying him even in the acutione before 4000 B C. The bodies found in these cometeries, the oldest in the world, are so well preserved that the continue of the stomach and the almost are the most acution to the stomach and the almost are the stage of the stomach and the almost are the stage of the st nt : the river terrace just outside the r le 1 stery jars accompanying those burials, ar found also wheat of the variety known as "mer a kind of split wheat This gram is a thousand years older than any und in Asia As a result of recent dis covery it is now evident also that the d mentic cattle sheep and goats possessed by the prehistoric Lgyptians were of birican origin, and were not introduced

llaving thus made the transition from the hunting to the agricultural and cattle-I redung stage long before 4000 B. C. the light that discovered copport in the Pennasule of Sinan, probably about, or not long lefore 4000 B. C. The state of the lefore 4000 b. C. T to form the eye. These crude copper needles are the oldest known implements of n tal wrought by man. The oldest copper it all wrought by man. The oldest copper-ince in history, still survive in Sina; ac-mpuned by the most ancient historical nonuments with which we are acquainted monuments left by the earliest kings of gypt to record their mining operations in tie thirty-fourth century B C
As metal came into more common use.

the Fgyptians likewise evolved a system of writing, and on the bass of agraculture, cattle breeding, metallurgy and writing there arose a great state on the Nile, the carisest known organization of several million souls, which began about 3400 B C Having thus gained a stable and organized form of the the keyritina broads 4545. form of life the Lgyptians brought forth a highly developed civilization in the thousand years between 4000 and 3000

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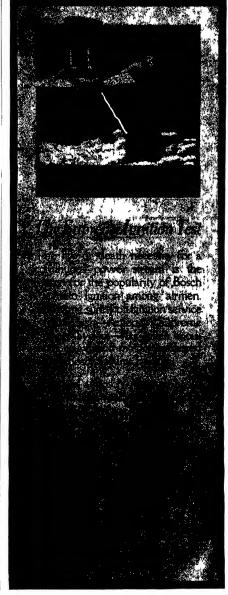
yet disclosed the successive stages of private shaterfor advance as in Egypt. The development in Bebylonas was evidently disclosed the second of the second

### Ornament in Old Prints and Drawings By William M. Ivins Jr

IN the Exhibition of Ornament m the cum of Art there are to be seen a number of most interesting examples of the manner i most interesting examples of the manner i which the craftsmen of past times utilised the pattern engravings made by the oli masters of design. Few of these designs masters of design. Few of these designs show any particular care upon the part of the designer in regard to such matters as perspective or true proportions and an even smaller number of them are measured or working drawings but the craftemen i evortheless knew how to translate them into the terms of the particular thing they were making such as the same tune may be interpreted by the verte or by many instruments. As an instance of this, may be taken the series of plates by such great artists as Raneon and Lalonde showing wrights and binches of fi wors and ribbons. combined in the most charming and beau commed in it most charming and beau tiful designs the engravings so delicate in line that to the casual glance they seem far bitter fitted for title pages or book plates or ever if rectales than for execution in any of the heavier in storials in which the interior decorator wirks. But over two of these fragile and dainty examples of the engravers art there are hung in the Mus-tum galleries great panels of heavy wood upon which the designs have been carved out as wall de oratios one in paint and the other in carved oak. The carved panel is particularly enlightening when comis particularly enigntening woon oon-par d with the tagraing because few woods are heavier or o'arser in grain than oak as 1 yet it has been used to perfection as the medium in whi it the peculiarly light and graceful lines of the otching should be given permanence Throughout the panel the design has been given more swing and its elements thrust a little wider apart than in the print so that its heavier lines could get the san e amount of free play Just as the engraving is a masterpiece of refinement and minuteness so is the carving one of the most beautiful among the many beautiful pieces of carved wood in the great Morgan Collection It would be difficult to find a more perfect example master craftsmen of old France utilized the wealth of design that the artists and draughtsmen prod tot d for their benefit

draughtsmen produced for their benefit in a case in the middle of the opposite wall of the same gallery are shown ormoly mounts for furniture among which is a series of swags and garlands which obviously were napired by these same damily etchings of flowers—the metal craftsman working his bronne se casily and surely as the painter or wood carver manipulated his own materials.

In the mallery contanuag the earlier works there is a splends thoroug of Reasinance design of this same abstract nature A single fram for instance, contains a reproduction of a print by Aldergrey: the original of which is in a neighboring frame and beside it reduced to the same scale pholographic reproductions of a sarved stone pauel a giased and colored store till and a bear my all bearing the







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workers which are accompanied in each case by a piece of lace or drawnwork or embroidery often made slavishly from the httle black and white woodcut design, and in other instances showing how the needleworker varied or simplified the pattern set for her by the woodcutter Many of these needlework designs were also utilized in their time by wood mlay or interess work ers and by wood and stone carvers in the laying out of work intended for panels and fricks in rooms and on large pieces of furniture and by mlayers and metal workers for borders around small boxes and

other suitable objects
I articularly important is the series of designs for cups and goblets in fine metal and dystal for in them can be seen the same elements utilized in embroidery, in of su h things in the great days of the Renaissance | there are a large number of most surprising flower and leaf designs which found their way into the hands of talestry makers, silversmiths, and the men who carved crockets and ends of chair man who carved crockets and ends of chair haidles Rarely if ever before in this country has there been an exhibition con-taining more beautiful and exquisite de-signs than this one at the Metropolitan Museum of Art and certainly there has never been one like this in which the multifari us uses to which designs of the greatest masters were put in practice have been allustrated by actual juxtaposition of de-sign and related work of the craftsman 1c the designers and craftsman of today le the designers and cratismen or women three-chibition offers an opportunity such as his never before been given them to see it ctual way in which their predecessors as all dithemselves of the wonderful maternal () be found in old books and prints and how they turned that wealth of design to are in a sureed that wealth of design to their (win purposes, especially to the long-headed business man, be he producer or distributer, who is able to gage the direc-tion of industrial art development in this grad compressions and abstract great country, such an exhibition is a source h information and an index of un limit I possibilities for the improvement of current products. Design has always been a selling factor, for design is bound to remain in all types of home furnishings and other industrial art objects the primary factor of musity. factor of quality

### Airplane Researches of Value in Other Fields

THI war has placed an opportunity in the hands of furniture and penel manu-latures to benefit by the increased kn whedge of the premiarative and char-acteristics of wood and glue

Under the stress of war and the necessity of furnishing aircraft to the fighting front in large numbers and a short time, it was found necessary to supplement the infermation available on wood and glue by extensive additional research work on these two important construction mat It was found in many instances that face teres taking government contracts for aircraft and wagon work had in their desire to help neglected to go into the situation thoroughly and found themselves unable to produce on schedule The rigid governproduce on schedule. The rigid govern-ment inspection showed them that their equipment was inadequate to meet the special demands placed upon it, and their knowledge of the peculiarities of the ma-

to be used in the hot, analy sections re- A series of tests made at the keyst and the series of tests made at the keyst and the series of tests made at the keyst and the series of tests and the seri the mere gluing of laminations and shaping square inch the block—internal stresses occurred that any to we caused warping and open joints in seems saved suit as

same design as that contained in the little print As microsting as anything in the whole schibithm are the two large floor cases between high grade laminated work containing rare old patterns for textile the class of work of carried with the containing rare old patterns for textile the class of work ordinarily accepted commercial standard. It is not su craft plywood for the various governme

aircraft speerfication arrorant specifications.

While waterproof gives have been in existence for some years, they were not well known and lattle information was at well known and httls information was at hand as to the correct procedure for their successful use. During the war the Forest Products Laboratory of the U S Forest Service at Madison, Wis, has been working on problems that seemed to give trouble to the plants engaged on war contrasts. Much help has been given manufacturers and a large staff of specialists has been ea-gaged in obtaining information and develop-ing new ideas in the uses of glues and wood

It must not be inferred that absolute phases of the uses of woods, and that the laboratory will be at once a panacea for all though much has been learned there is still much to be done It is merely pointed out that the Government mainte under jurisdiction of the Forest Service tution equipped to handle many of the difficult problems continually arisis in the manufacture of furniture and panel me continually arising

### "Pertinax" as a Substitute for Mica and Other Things

THE compressed paper product, called "Pertinax" is a useful substitute for mica for electrical purposes, according to a report in a German paper The parmes for electrical purposes, according to a report in a German paper. The par-ticularly high insulating qualities of mica are connected with its peculiar structure in layers, and this structure has been suc-successfully imitated in "Persinax." The material is particularly able to withstand pressure (for instance, in the shape of tubes, it is far superior to lead tubes as regards its resistance to internal pressure), and it can easily be worked similarly to wood, that is to say, it can be to stamped, and drilled "Pertinax" stamped, and drilled "Pertinax" ap-proaches mice very closely in its electrical properties. Its puncture voltage is about 25,000 volts. The material is not affected. properties Its pluncture voltage is about 25,000 volts. The maternal is not affected by hot oils, and only begins to be destroyed at 200 degrees centigrade. The tensile strength is 8 85 tons square inches, and is therefore, nearly as high as that of the best

The word is counsed from the Latin pipes are made by impregnating shee paper with synthetic resin, and rolling them around a mandrel of the desired dimensions until the proper thickness is secured Heat and pressure are maintained mean-while until a hard product is obtained While that a hard product is obtained Formerly natural resuns were used, but the introduction of the synthetic variety has raised the temperature of softening to above 180 degrees centigrade

above 180 degrees omtigrade
Difference of opinion seems to exist as
to the effects of water upon the material
Though one writer claims that it i insoluble and water-proof, another states
"Their aborition of water makes their
use madvisable for that liquid, but thay
gave excellent results when used to carry
oil, a fact which is explained by the wellknown resistance of synthetic resins to
othe" There is no record of their being
used successfully for water pipes, though
they were practical for carrying gas and
oil

snowings of the peculiarities of the me-terial was not sufficiently exact.

Many varied difficulties were en-countered Vehicle manufacturers had in the control of the co Experiments showed that pertinex p

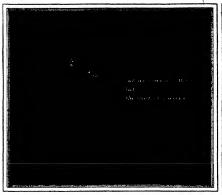


-at the Copley Plaza, the Tourame, the Parker House and Young's, in Boston

-and at dozens of other leading hotels (and clubs, too) all over the country.

Lypotenky us Fabran Co.

# FATIMA A Sensible Cigarette



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pose is to collect and select scientific and practical information concerning progress and developments in the art of inandescent lamp manufacturing and to distribute this information to the companies entitled to receive this service.

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RESEARCH LABORATORIES OF GENERAL ELECTRIC COMPANY

# Behind the Motion-Picture Screen

THE mysteries of the "Movies" are bared at last! It has remained for the stating of the stating

Scenarios The Director and His Work Motion-Picture Acting Motion Picture Cameras and How They Work The Cameranan in the Land of Mak Polieve Studies Mon Stuff Tricks of the Screen Laboratory Work. Pictures



in Natural Colors. Microscopic Subjects. Talking Pictures Animated Car-toons and Sculpture. Motion Pictures in Odd Pields Motion Pictures is the Home and Business. Present Status and the Future of Motion Pictures.

This book has been written in a simple, interesting, and instructive style its not technically put incovers all phases of the scenes are in an example of the notation of the state of the in book making. "Behind the Motion-Picture Screen" contains sate prover 300 illustrations, printed on the finest coated paper and bound in a tive cloth cover measuring \$1/4 by \$1/4 inches. Price, \$3.56 set; Postage and on the finest coated paper and the printed of the printed by the printed printed by the 
Special folder containing full description and sample pages, sent on request.

SCIENTIFIC AMERICAN PUBLISHING COMPANY

BOOK DEPARTMENT Woolworth Building . . . .

**New York City** 

# NEW BOOKS, RTC.

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387 pp.

The folk tales of the Kutenal disclose an intimate relationship to those of the tribes of the
pistoaus and the eastern pistos. Many of these
states are brought together here, the original
anguage being paralleled, and in some cases interlined, by the translation; they are followed by valuable abstracts and comparative notes, and by an extensive vocabulary.

THE BUSINERS OF THE HOUSEHOLD. By ('W. Taber. Philadelphia and London: J. B. Lappincott Company, 1918. Svo.; 438 pp.; illustrated.

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construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the construction of the constr

actually, ase it, for the plentitud interactions are naturally as the proposition of the plentitude of in their velocities, distances and periodic times conform to the laws of balanced weights revolving ontally and falling at the same time.

A TEXT-BOOK OF AZEONATTICE. BY HER-man Shaw, B-Sc., A.R.C.S., A.T.A.E.S. Phildelphia: J. B. Lippincott Com-pany, 1919. Svo.; 260 pp.; Illustrated. Lectura delivered before officer of the R. K. form for the use of students; the elementary mechanics of the subject are developed, with the lifumere of various factors on conservation: extra and sire revew, striptace design and types, maintennaive are concledy dealt with. Other chapters take up halloons and stributy, newlysiston, metocrology, bomb-dropping, wireless, and serial photography. There is a proteinion of disagrams, metocrology, bomb-dropping, wireless, and serial photography. There is a proteinion of disagrams demonstrate engine design and

map-reading.

HAMM AND COMMUNITY HYGIENE. A Text-Book of Personal and Public Health. By Jean Broadburst, Ph.D. Philadel-Bullet Philadel Phila

air, and sowage and refuse disposal, luminating chapters is discusses the trans disease, distriction, the house, summer and school, and muttal hygiene. It is a rea enjoyable book of facts and methods.

and school, and mental hyptime. It is a reachible, assignable hook of feets and mostate and a signable hook of feets and mostate. Their entertainment of the feet 
before the student, and the book makes a good instance, the statement when the students of the housekeeper, the final chapter of the housekeeper of the housekeeper, the final chapter of the housekeeper, the final chapter of the housekeeper of the housekeeper, the final chapter of the housekeeper of the housekeeper of the housekeeper, the final chapter of the housekeeper o

ingure climbt the teachings of the sast.

VALVER AND VAIVE GRAIN. Vol. II.—

Gasoline, Gas and Oll Engines. By
Franklin De Ronde Furman, M.S.
New York: John Wiley and Sons, Inc.
Str., 146 pp.; illustrated.

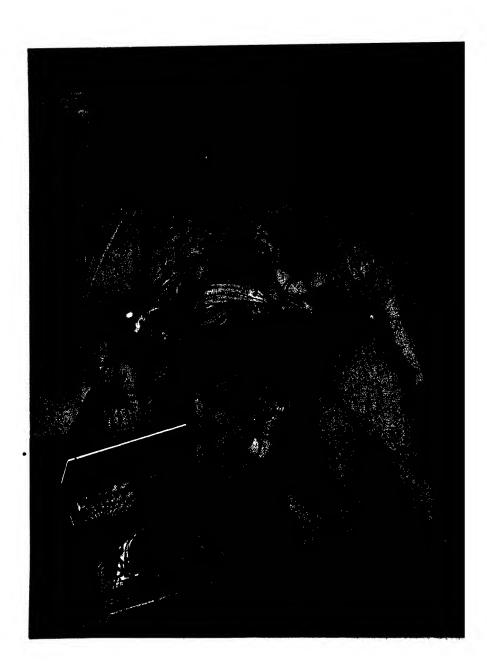
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steally handled. Alto vo Insertification of Geological Fours. By J. A. Udden. Austin, Texas: The University of Texas: 15 of pp. 100, 100 pp. 100

# The First Pneumatic Truck Tire Built





# SCIENTIFIC AMERICAN Between in second class quarter from 18, 1879, at the post office as New York, E. Y., under the Ass of March 2, 1879. 4 AURI 1919



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He will tell you the Irrangle B wrench fits his hand as if it were glad to work with him \_its steel is tough (not brittle) with a hidden some thing in its makeup which means honest years of service instead of dishonest months of trouble

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several thousand men fifty years to make It is the value behind the Triangle B trade mark On a tool, a drop forging or a great machine, it says Rely on me," and it has said that to the world of industry since the days of the Civil War

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A Hartford

The First Commercial Drop Fordino Plant in America Hand Tools - Foróinós Foróinó Machinery

# MACK/PROCK/FRAIN

MACK-depose retrigerative cary-one most feat of performance which MACK True adaptable, powers send chimatin are consistent effects of the construction of the construc



"PERFORMANCE COUNTS"

# SEVENTY-FIFTH YEAR (COMPANIE) AND COMPANIE COMPA

# THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

ABITME CXX !

NEW YORK, JUNE 28, 1919

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Draft 8 feet 2 inches Dispiscement 1 000 t.m. Oil find capacity 228 tons Moutre power Horse power 26 000 Speed on trial fully equipped with find for 1 000 miles 39 6 knots per "Turqueber", which holds the world s official record of 39 6 knots for four hours Motive power twin turbines direct connected Revolutions

# Developing the High Speed Destroyer

THE following story concerns the last six years of destroyer construction in the British Navy, and in the beginnings if takes us book to the days of McMckens, who, as First Lord of the Admiralty, had built 60 destroyers of Admiralty design when were termed "374coot boats" The speed of these cross-termed "374coot boats" The speed of these cross-termed "374coot boats". termed "27-knot boats" The speed of these craft wrand from 27 to 29 knots. One of the best known builders of destroyers had urged the Admiraty to discontinue this class of construction, as being too slow to compete with the destroyers that were bump built by the Germans, which had a speed of 30 knots. It was urged beat to the destroyers that were bump built by the Germans, which had so speed of 30 knots. It was urged beat to the Germans of the transpect of the Knots of the Germans of the transpect of the Knots of the Germans of the transpect of the Knots of the Germans of the transpect of the Knots of the Germans 
operations All of them a heved phenomenally high speeds. The record for the class and indeed the speed record for all destroyers, so far as our information goes was made recently by the "lurquoise on what is known as the Skelmorite Mile which is at the mouth of the Lyde Here, on her official trials site attained a mean speed of knots on a four hours continuous run

It should here be remarked that the Skelmorhe Mile is selected by the Admiralty as the most reliable measured is selected by the Admiralty as the most reliable measured use for trails of fast vessels he kause there is a depth of water of 240 feet which is the least depth upon which trails can be made with a reliable result at the high peceds now prevading with destriyers for it has become known, and is now fully recognized that higher speeds can be obtained in very shallow water than in very deep water, for this reason no trails are now made by the Admiralty at the mouth of the Thames I he effect of very shallow water steep give a false mercase of speed to destroying, which in former days was never supported. Another Ranous destroyer of this type in the

Mounsey which vessel not only attained the excep-tional speed of 39 knots on her offerill trial but while

tional speed of 39 knots on her offeril trial but while on active service was the means of recump objectorous from the Crusser Ottanto during a gale of wind The Turqueous is fitted with 16 transverse bulk heads dividing the hull into 16 man compartments, which are further and divided by the watertight and odlight decks. The petty officers and crows quarters are forward of the machinary space and the commissioned officers quarkers are aff. The vintulation of the crew spaces forward is by means of a fan and system of distributing trunks thus avoiding the necessity of cowls on the forecastle deck which are a source of trouble in had wenther

The gun armament consists of three 4 meh quick-firing guns one on the forecastic one amidships between the funnels and one aft also an ante aircraft gun. The torpedo armament consists of two sets of twin 21 meh torpedo tubes with four torpedous

he propelling machinery consists of two Brown Curts turbines coupled direct to the main shafts and capable of developing about 26 000 horse power. In bodons are arranged for burning oil fuel and the oil fuel capacity is 228 tons

We have been favored with the official

We have been favored with the official data of the acceptance full speed trial of the Iurquoise which took place March 14th of this var I lint was no wind and the sea was sureed in the best ax miles this speed as were successively 40 74 3913 and the sea was sureed in the best ax miles the mean speed for the whole forces and the mean speed for the whole forces and the sureed as the bollers was 262 78 pounds, at the engine-room 231 pounds, and at the engine-room 231 pounds, and at the the engine-room 231 poonds, and at it is nozzle-chest 213 5 pounds. The mean su perheat througout the four hours was 95° resembled to the control of the con perneat throughout the four nours was 95°.

F vacuum 27.75 and mean revolutions,
711 The propellers are three-bladed 7.ft
11 ins in diameter. It is probable that 35°
knots contract speed will be 41° futur
unnimum. War service has sh wa that destroyers can be built to stand herd usage.



"Turqueice" driving at high speed into a rough see

# SCIENTIFIC AMERICAN

Founded 1845

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Sentered at the P set. ffice of New York, N Y as second Class Ma Triads Mark Northern: If 8 United States Patient Office Spyright 19 y Indicatific Asserting Publishing Co. (real Britain rights reserved Illustrated articles must not be repredented without permission

The object of this journal is to record accurately and lucidly the latest ecientific mechanical and industrial news of the day As a weekly joural at as in a post tren to announce interesting developments before they blished electrical

The Editor is plad to have submitted to him timely s suitable for these columns especially when such articles are accompanied by photographs

### Laurch in America-Breakfast in Europe

EARCH through the history of all the arts and sciences and you will find none that has furnished so much of the sensational and the heroic as the test of them all the art of flying—that amazing child of the Twentieth Century Scarcely have we caught our breath at the announcement that a seabird-a boat which had taken unto itself wings-had flown from America to Lurope by way of the Ascres and the Spanish Main than the message comes that a land bird scorning its native element had swept across the Atlantic from Newfoundland to the Irish Coast in one wild flight of sixteen hours and a half

It should be noted that for both of these performances we are indebted to the exigencies of the great war The NC-4 which Commander Reid piloted so ably was built to fly to Europe and there engage in submarine The Vickers Vimy bomber which carried Centein Alcock on his amasing dealt was built to bomb Berlin In both cases practically all that was necessary was to substitute an equivalent load of extra il fuel for the load of bembs and the machines were ready for their etime venture Nor should we f rget that engines of the necessary reliability and power for transatiantic flight are also a legacy of the war The Liberty motor was not conceived until we were c minitted to the great struggle and it is entirely a chill of the war Royce mot r had won great distincts n it is true long before the war started but it was built only of the moderate horse-power required for automobile service The 850-horse-power engines of the Vickers-Vimy machine are a war product

The outstanding facts of the non st p flight of last Sunday night are the astorishing speed of about 120 miles an hour and the unerring pre ision with which Lieutenant Brown the navigator 1 ld his way over the course of 1950 miles The speed and distance are the given in the cabled dispat hes the exact figures will be known when the log times f start and at ; etc have been analyzed and rep rted up n by the Royal Air Force to which b th Al k and Brown b long

Full particulars of the machine were given in our last issue Its weight as tleft the gr ind is stated to have The fuel supply was 871 gall ns or suffi cient for 25 hours at a cruising speed of 90 miles per hour The meteorological conditions were g d A westerly wind of 30 miles per hour was blowing at Newfoundland and southwesterly to northwesterly winds were predieted across the Atlantic for the next twenty four hours Except that a drift indicator was carried the navigator relied upon the sextant chronemeter and compass According to cabled reports the trip because of fog rain and si et was a very hard one and only three observations tw of the stars and one of the sun wer possible m reover but little use could be made of the draft indicat r Ti e p : r visibility makes all the more wonderful the unerring course which was followed for the landing was I ade within a few miles of the place selected by N vigator Brown The machine left St Johns Newfou iland shortly after four (Greenwich time) on the aft r on of June 14th and landed next morning between nine and ten o clock, near the wireless

station Clifden, Ireland. So these gallant lads, who had lumshed in America, had

their breakfast next day in Europe.

Captam Alcock completed the flight with one-third

of his fuel remaining in the tanks, sufficient for another eight hours of flying. He nursed his engines excefully keeping them notohed down for a speed of 90 miles per hour. The difference between this and his speed over the water is 30 miles so the predicted westerly winds must have prevailed throughout the trip and their aver-age velocity spust have been about 30 miles. If the 30its wind had been against him and he had elected to run at the same crusing speed of 90 miles his time would have been 24 hours and his fuel supply would have just sufficed to put him across

### We Should Hasten Battle-Cruisers Construction

F all the ships of the three-year program the six battle-cruisers should receive the first attantion We have not one of this important class of ship in our navy today This is due to the exigencies of the war There was a call for destroyers, and we built them In this we gain some compet for in vessels of this type built and building we rank close to Great Britain, who is making an extensive sale of her slower craft and we have a much stronger destroyer fleet than Japan or any Continental power But the absence of battle-crusers leaves a serious gap in our fighting line and these ships should be given preference over any other type in the matter of appropristions and facilities

Unless some other naval power should bring out a new design these ships when they go into commission, will be the most powerful and fastest of their type affect With the exception of the new British composite ship

Hood they will be the longost ships in any navy with an overall length of 872 feet. The nly vessels with which they can be compared are the British Renown and Repulse drawings of which we published last week These are just under 800 feet long But in gun-power and speed ours are greatly superior for our ships will carry eight 50-caliber 16-inch gins as against six 42-caliber 15-inch and their speed if expectations are realized will be 35 knots as against 11 to 32 knots side armor was to have been 5 inches but now that all the bulers are below deck the arm r that was assigned to the upper boilers will be available as extra protection on side or deck

The sinking of the three British battle-orusers at Jutland due to shell flash reaching the magazines em phasizes the importance of giving spe ial protection in the way of and above the magazines It is true that two of the ships had open or indifferently closed ammuna-tion hoists—something that we attended to years ago But in all lightly armored ships in these days of heavy long range shell fire it cannot be denied that the magsines are the danger point

Therefore we again suggest that it might be well to consider whether a drop of the speel to 33 r 33 5 knots would not release sufficient boiler and engine weight to thicken the deck protection al ve the magazines I ut ire shell fire will be controlle ily radio from unheard of ranges and the angle of full will be steep. Already guns are afloat that fire a 3 000-po ind shell. It will take careful planning and the I beral use of horisontal armor to prevent the flash of such a shell from reaching the magazines

# Spruce Up!

CERTAIN canny con tryman found that hm A house needed a coat f paint and a fresh layer of shingles over the porch On the basis of house needed a coaf f paint and a fresh layer his old bills for similar work he fixed on \$400 as a fair price but when he called in the local contractor, he discovered it would cost him \$500. So he put his foot down and said he would wait for prices to come back to the usual level

A year or so later sure enough prices did come down But when the canny one again jut in motion the matter of repairs he found that the xtra year of unpainted nakedness had caused his clay boarding to deteriorate to such an extent and that the bad shingles had allowed so much water to go through t the underpinning of the porch roof that to put his house in order at the low prices of the day would cost \$600 He is still seking hims how much be made by waiting for prices to drop,

In another one, the first chapter of title instead of the fortuner was deplicated. But have prious never fill down; and the thefity gentlemen finds kinned for the position of the near who enver that he revised near have he had required the position of the near who envers that he revised Rendelect.

In still another community, it was the willage heeper who wated to have necessary making effected on his house and his garage and his automobile and other property And because of his influence in town-meeting, he renovation of the schoolhouse and the building of badly needed new bridge and the rescastruction of several badly washed-out places in the roads were stocked by the core wasting the drop in prices. The consequence was that the local expenter was unable to meet his interest and was put out of business; four residents who had work horses but no work for them residents who had work horeas but no work for thus, reated them, for the season in another town, the find dealer moved to the city because of this loss of tends; the best part of the surply of dany produces was out off when a hig producer had to this to the next village, further away but with bester roads; and the gazerd prosperity of the home town got a kink from which is never re-

The application of the above parables may not be obvious but it is none the lass direct. During the period of the war we concentrated all offorts in work of wartime value, and out off labor and supplies indiscriminately from other lines. Prices of everything went up nse of increased demand and reduced supply ar at the same time the machinery of daily life was getting more and more out of order, more and more down at the beal, more and more in need of extensive renair and metruntion

Now the pressure is relieved, not se much as regardenes, but certainly as regards the propriety of us labor and materials for whatever purpose we will It is true that as yet we do not know what will eventually happen to prices—whether they will stay where they are or go up or fall off. But in any case the amount of repairs that each one of us owes it to himself to make is not large and could easily be afforded if we but thought

If every one of us by going shead with whatever work he has to do will contribute his mite to the general amployment and the general business welfare all will go mmingly and the country will regain its normal keel without mishap But if any large number of us attempts to play the part of the canny fellow who waits for prices to go down we are going to get left in precisely the way that the heroes of the above parables got left. The eretary of War realising all this has inaugurated a Spruce-Up Campaign urging everybody to help the return of normal business conditions by doing the little things that have gone undone for the past two years

Everybody should be aboard this band-wagon there is no scouse for a surgic absented

# Waste Paper Mill Bark as a Source of Tanning

THE feasibility of using waste hemicok bark from paper mill operations for tanning purposes has been further demonstrated in recent tests made by the Forest Products Laboratory Results obtained first in an experimental way were so encouraging that the investiga-tion was finally carried out on a semi-commercial scale in cooperation with a paper mill, a takenery, and a manu-

in cooperation with a paper smill, a businery, and a manu-facturer of drying equipment. It is found that no growt technical difficulties stand in the way of utilizing paper-smill bank for such purposes. The product is satisfactory from the teamer's standpoint, and it can be prepared at a cost which will allow in the computer with last bank.

see or use of paper still back for teamin would insee a source of income for the paper still from a susjently which is now of little or no value. If would also, he is dividend on a susjently which is now of little or no value. If would also, he jake interned in a suspense problems of elevants published. The tanner would be assessed of a orinitial tappy; and stick their which would allowed him to heap made in an assertable in adjustment of the dispersal in a size of the size in the dispersal in a size of the size of t

### Builton and and

Whitelets Tunnelling Under the Start River.—A very interesting Start of counting was recently done on the Start River in the Start S

Binkind Calescons in Shifting Ground,—There is an silectric light and power company located 500 feet from the Petagose River near Baltimore, Md. A cobleway carries scal from the reverse to the power house and case is also steed in the space between the power house and case is also steed in the space between the power company carried the evention of a new housing tower and bridge to handle one, but the weight of the stored coal had carried a nevention of a new housing tower and bridge to headile one, but the weight of the stored coal had carried a nevention of the space of the tower foundation in this acting ground wound the rave and it was realized that the construction of the tower foundation in this acting ground would be carried on writh difficulty. It was desided to sink cassons at an angle on at a callow for the movement of the pround and this was done by suppending the calcons from a tunber feature that the same of the power of the contraction of the contract of the contract of the same of the

Highway Engineering Courses in Colleges—In a passal less of the Beplaneire New Record, attention is assisted to the weakness of road senjective courses in our colleges and universities compared with the pract model for trained road emposers and material impostors. In order to become a rathroad segment a man, sitter graduating from a colleges in which he has taken swerred courses on engineering, in oblique to work under the supervision of an experienced reastest emposer so that he becomes theretaphy grounded in practical rathroading. On the other head, there are few solonis which device much attention, to the subject of lagiway engineering and the new who take obarps of the construction and mantenance of our public roads are largely unbrunned and in experienced. Turchemoret, they are constantly changing because of political changes. We are preparing to spend many mullions of dollars in road construction and the spinning of this meany should be placed under the constant of the subject of the sensy who have road-und proper education and despendence. There should be short courses for the anny road efficiels who are not enganess and the public should be discussed by means of public lectures, exhibits and existing an existed in the press.

Britáging the Deinwure at Philiadsphila.—In a paper on the proposed Delawire Biver Britán, resently rebibled, it for Journal of Engeneer' Chie of Philadsphila, De Warren P Libri points out the importance of commenting Philadsphie with neuthern New Jerusy da present there is a redgreeoul relation between these comments, but there is an experimental between them to communication and here produce an electric street in the product of the produce and comments but there is no experimental between them insense by the archive persons of forcy transportation. A hidden as this point would not only be of local importance that it would not provide an absenctive root for valentum tendie helvegen Philadelphia and New Tork. At present the provide an absenctive too force passes over the Dilayeron of Thurstee, but empt for a way want street in the instant sufficient is specific between these chose passes over the Dilayeron of Thurstee, but empt for a way want street in the context pick force for the passes of th

### Salemo

British Geological Seciety Admits Women Members —Another of the leading scentific societies of Gress Britam, the Geological Society, has decided to admit women as follows The stop has been considered by the society on three previous considers with negative

Biarons of Mines Mission to Europe.—The U S Bureau of Mines has sent a special mission abroad to study the methods adopted or under consideration for restoung the mining and metallurgood plants and in dustries in the regions devestated by the our The members are F G Cetterid O S Rice W Perdue and F K Probert, the last-named of the University of Californe.

Monquistees Two Million Years Old —Writing and this probable antiquity of monquiston, as shown by the galagual record Frof. T D A. Contered of the University of Colored, states that the oldest forms positively identified, as belonging to the genus Color or other genera of the assequent family have been found to the genus Color or other genera of the assequent family have been found to the probability of the state of the second rocks, and are probably about two million years old. A form known at Color descenders we as described by Resident from the Green River bed of Wynning Assessmen Sources question has lately been discovered Wynning Assessmen Sources question has lately been discovered Buryon near Calesdral Riuf, in wastern Colorado and is to be called Culas contobers.

Princel's Bortunest Dictionary—Assording to Science, the unique dictiousry of botanesal illustrations published by Prites in the middle of the last century and long mass out of prints is to be brought up to date and researed under the simplers of the Royal Hortunitural picture or illustration of every known plant giving a reference to the hooks and appse where they may be found. The entries number about 100 000 and run down to the year 1986 It is estimated that at least 135,000 additional extricts will be uncorporated in the new continuous to the continuous continuous and hortunituration is in charge of the undertaking and the U 8 Buyman of Plant Industry is to coopporate

Goldenzed Net Responsible for Hay Fever — A probant has recensily been rased against the time honored project of adopting the goldenzed as the national flower of the United Bates, on the ground that this plant is a seasor of lary fever and hence nothing ought to be deen shart would encourage to prevalence. A statement has now been sweed by Dr. W Schappsproll on behalf of the American Hay-fever Prevention Amoriation in detense of the goldenzed. It is asserted that while the polling of the goldenzed may come troub when applied densely to the notifies or used in large quantities for room disconstance in a chemical polymer of the goldenzed may come troub when applied foreign to use of our most beautiful foreign." may be designated by the last one of our most beautiful foreign."

salestion as the asknoat flower of the United States

Lima Jusio fee flagury—An interesting paper by
four female authors, recently published in the Lenezineds new light on the sid studyed of the use of imm yuice
to prevent sentry on simplocat. It appears that after
having enjoyed a high requisitor from the latter part
of the sighteenth embury onward especially as the ments by whathe surray was bandaded from the British
narry, lims juste has fallen into disfavor in ricord vears.
Archie suplements have empressed acoptional views of its
rules, and it has been adversely criticised as a prophyloside or thempatishe agent in the latin gray. The
sushiers espect superiments on animals shewing unjuste to be of this value, whereas knoon just is effect with
in Emburous flags, it was been any one of the authors,
first Emburous flags, which proved no effective in servdery one made who significant discovery that the
crightal "Rine below," wides proved so effective in early
days cause frest big Highterwanan and white party
days cause frest big Highterwanan the single frame of the
served from thesessy sides but they with the juice of
the serve lines, which as if a now appears its values against
terry. The ciphods rightens why "High piece of
the serve lines, which as if a now appears its values against
terry." The ciphods rightens why "High piece of
the serve lines, which as if a now appears its values against
terry." The ciphods ithinates why "High piece in the
fallow late disreparts. It as offered was annother to lead to the
material travelsion that may are from confusion in
momentalistics."

# Industrial Efficiency

Lead Poleoning is being investigated these days because of its widespread existence in various inclustrate. The Working Conditions fevries Department of I also has prepared as a guide to industrial phyracians a schedule for the physical examination and feed workers in which provision has been mad far covering not only the typical manifestations of lead poisoning but also for bringing out the previous history of the worker to the provision whicher hasards in other industries may have the day of the provision whether hasards in other industries may have the provision of the worker to the provision whether hasards in other industries may have the provision of the provision of the potential of the

Accidence in the Iron and Steel Industry have decreased by more than two-thuds during the past 10 years as a result of the movement to enforce safety regulations according to a sport recordly made by the Birsau of I shor Statetus In 1907 the report shows 245 men were killed or muured out of every 1000 sarpoyed while in 1917 the societant sate was reduced to 81 per 1000 A further reduction would have been recorded in 1917 but for the dislocation of industrial processes to meet war needs the report afds The majority of arcdinotas are declared to have resulted from defe-tive machinery and the employment of incorparacred men.

Service Insignia —It is strange to note how the war has affected persons in regard to the wearing of special uniforms or insignia. As more and more of our young en went into the khaki of the Army or the blue of the Navy so did more and more men and women don some form of uniform or other either as workers in some branch of war work or as employees with a public service corporation And now the influence of the war seems to rest lirms and public service corporations here and persist I irms and public solves of insignia and services there are encouraging the use of insignia and services Motormen and conductors on cars and trains, who never bothered with service marks are now to be seen with bright gold stripes Employees of large manuf scturing companies and public as are in many matances being supplied with distinctive buttons which in lude some form of marking to in-depart the length of a rvice. Buch insignia so it is reported serves to encourage long service in a company

Phosphorits Deposits in the Notherlands—The scravity of phosphate furtheer in the Notherlands during the war when imports were at spel led to inquiry by experts if this country itself could not by some means amply the defect in Co. Der of these experts it is new announced has found phosphorito fields in the Provinces of Drenths and Overs see in northeastern Rolland the deposite being grayash stones or petritacions of Rolland the deposite being grayash stones or petritacions of Rolland the deposite being grayash stones or petritacions of the semilar foreign substance contained two two that similar foreign substance contained twos that quantity nevertheless the quantity was sufficient to be of great value as fertilizes. The investigation resulted in the exciton of a large factory where the being thoroughly washed to remove all deleterious sub-banes. Many farmers and landowners have placed orders for the product it is stated, and delivery will probably begin in April

British-Made I absentery Glass —According to as article in the London Twee of recent date the manufacture of laboratory glass started at Shafindi anne the wre has made substantial progress though much remains to be done if the industry is to be commercially sound and able to complete in the world s markets Proor to the vest there was no manufacture of laboratory glass in Cornel British and the whole process hithorto confined to Germany had to be discovered and workers specially traumed. With this object a department of glass support of the Government and toolsy the apparent of the Government and toolsy the department of glass reports of the Government and toolsy the department of glass reports and the heavy produced. The graymental in nature of the work has made she cost of production heavier than the German states and to help this a glass reasons monestian is being formed. The British Government has been added to provide 5864 957 over a period of its overars and the manufactures will contribute a further s in of the amountainty will be directed to problems of manimery will be directed to problems of manimery will be directed to problems of manimery of manimery will be directed to problems of manimery

# Thirty Million Years Ago

# Newly Discovered Pre-Cambrian Sea When in Earth's First Creatures Were norm

THE Smiths i an Institution Washington announced the discovery by Dr Charles D Walcott of several the useful fossels in the canadian Rockies, of animal first much more highly regained than those which he lad fund privousely. Annually in summer he has taken out an expeditum to this region, devoted injuvely to collecting fossils from the formations known as the cambrian rocks. He was the first to find many firms believe the Selbrans was a Bertofore, he had found sthing below the (ambrian period and all of the latest o mining perow the Cambrian period and all of the latest cy dutionary books of 1918 commen c the period of first similar without backbones with this stage of earths history. His new find upsets all previous discoveries and history. His new find upsets all previous discoveries and calculations including his own in that he has uncerthed wonderful animals in fossil form for helow the Cambrian. only one-celled Amoeba etc existed In other words in the geologic age in which we had supposed there was merely uncellular animal and vegetable his evolving merely unrellular animal and vegetable nie everying actual swimming and crawling water forms of atimals were already dominant. Dr. Walcott says in substance

Explorations of Cambrian and pre-Cambrian for mations have brought to light evidences of life far earlier than heretofore known. The field of the summer a mations have brought to light evidences of life far earlier than heretofore known. The field of the summer a investigations and collecting was the Burgees Pass Fossil Quarry discovered in 1910 but which did not yield its treasures until after years of hard work. Burgees Pass joe 3000 feet shows Field B. C. A section of about 180 square feet was taken out on this trip practically exhausting a quarry which has pelded the finest and largest sories of perfect Middle Cambran Gossil yet discovered and the finest invertebrate fossils yet discovered and the finest invertebrate fossils yet discovered and the half tons of special where Mort than one and a half tons of special.

where More than one and a half tons of spe mens were trimmed out of the shale rocks with minds were trimmed out of the snale reverse with the assutance of Mrs Welcott carried by pack horses to camp and thence to the railroad at field and are now in the National Museum It was necessary to blast out the back wall

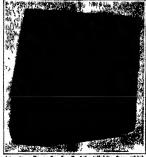
It was necessary to list out the cook wait of the quarry left from previous work to obtain the fine pieces encased in the fossil bearing rock. When the large slabs were finally blasted loose they were carefully split with chisel and hammer exposing the fossil romains embedded between the lammae of compact siliceous shale

between the lammass of compact silocous shale. The remarkable thing about this shale is that it preserved animals that were soft and non-resistant as jelly fish worms and the internal part of worms and erab-like animals. One of those earliest forms on earth, is a swimming crawling erab seven inches long It had two large (yes an front abown by round white spots sax trong ribs and a large tail Branchiae or gails sinne through the thin shell as well as traces of the logs. Another currous the server of the compact of the server of the server of the compact of the server of the serve ber with many flexible podia or false legs. A small round shell happened to rest on the sea bottom just where the head part of the animal was later pressed down upon it Another soft bedied form is Portuli mira related to the bodied form is brotain mark related to the holothurian which may be seen growing on the sea bed at Santia Catalina Island California There was also an imprint of a mud loving Atman which usually lives burned in the sand the shale bed at the quarry suggests that the waters of the amount Cambrain sea above

it swarmed with life just as the ocean does to day at Santa Catalina Island. But this was long before the advent of fishes on earth so there were no fish and no traces of them occur in the fossil bed The superb preservation of fossils at this quarry is all the more remarkable when we consider that they have been buried I comis at this quarry is all the more remarkable when we consider that they have been buried for twenty million vears or more and subject to all the vicestudes that rock material experience from the time they are simply hardened mul lurned binatil thousands of feet of thickness of lyers of multi sand and publish like all wirth changed and of the state o iater compressed at l cl vated into mountain ranges and more or less worn away by atmorio ageneres

spheric agencies

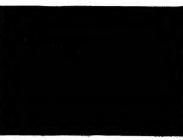
Bassed upon his purely geologic computation
of the tizze rates of deposition and maximum
thickness of strata from the base of the Cambrian period upwird Dr Walcott's exact
cestimate of the time it see strange first animals
were engulied was 27 10 000 years ago. He



An extraordinary fine facell of the trilebite, from which Handlirach traces the dragon-fiv, the first innert



A larger helothurian which evolved the first tabe feet



An elongate crooping holothwint (see cucumber), which evelved the



An actinian, above holothurian, the first mud living satimal, which now lives buried in and

adds to this appalling figure, 17,400,000 years & which these and other constants were overlaing from other, callfed the pre-Palaconic sprints. We have a gasicalized aconquistation, based on measurer sized as a gasical conquistation, based on measurer sized as a first first forms of life on earth spapered ed. 1,450,000, ago Charles finds that there has been a maximum of male and the many first space of the sized of siz

clearibles the strongs animals found by Welcott prior to the above discoveries as follows:

"The discovery of a world of highly specualized and diversified meredents life in the Middle Cambrian seas completely seaferns the prophecy made by Chasine seas completely seaferns the prophecy made by Chasine seas completely seaferns the prophecy made by Chasine provided the season of the continuation of highly specialized forgas. By the Middle Cambrian, the continuation season was also been season of the present of the Corolliers of the Pacific coast. In the present region ofly alades of the Burgess formation, the remarkable columns of the season of the season of the continuation of merebraria life of prior to Cambrian time, stands revealed by Walcott a discoveres. It is at case when the season of the season of invertebrare evolution of merebraria of invertebrare evolution in the season were reached some thrity million years ago. The man feature of his discoveries is being the season of th

orings for slowly moving and sensite (without front stalk) number. In contrast were swiftly moving types, Sagstia, sto, whath can aknost be said to have been built on the lines of modern submarines, and whose mechaginal means of propulsion resembles those of the most primitive, but later dearling fishas Other types such as Crustanou (shell fish), have stellard parts for the tepic purpose of detectors, offense and loomortica, purpose of detectors, offense and loomortica, purpose of detectors, offense and loomortica. Falconson time they include the slowly moving. Paleonson time they include the slowly moving. m-living, armored types of there were other slowly movi From thore were other slowly; ilving forms, such as brackipods with very dones armsture of carbonate of lime Finally, the types such as july fishes, chemby poisonous secretions of their Our first astend lambda.

t sees may be com home-shoe crab, certainly a relative The two animals strikingly similar chiefds, nts, etc, by which they as on the ocean floor, bested by their shells processed by thair abelia The rook diagrage so commbers of the protected by heathery than professed by heathery than the professed by heathery than the professed by heathery than the processed by the professed like the modern burrowing sea sucumber" The characteristic elongated sylindrical body form,

with longitudinal muscle bands, with longitudinal muscle bands, is clearly preserved in the fossil forms brought back by Dr Walcott's expedition. A remarkable and problemate mid-Cambran fossil A remarkable and problematic mid-Cambrian fossil Ridoss, is regarded by Wisdoct as a free symming, or pelagic saimal. It bears a superficial resemblance to the modern medua, or jelly fish, while the lines radiating from a central rung suggest the cantence of a water vesseller system, but like the wimming sea cucumber, it has the spiral intestine, seen through its transparent

The feesil camp (right) at Burgess Face, and a gilmpse of the explorers at work

mites. It is possible also that various insects were derived from the anciezt chitin armored articulates as well as crustaceans and barnacles. As Schuckert notes well as crustaceans and barmoles. As Schutcher notes all of these later swarms of last clawer attracted row water by the increasing venture of Dovonian times mak ang for speculiatators shot daptations looking toward more general feeding in gir and on fand.

uel on page 698)

the tissue which it has pointrated There must be a method developing vacuum pr ssure. If as is probable the prof seis per forms this function, there must be an airtight contact at the point mentioned above. With this in mind Mr. M. J. Phillips of Pritsburgh has made the photomicrography studies that are reproduced herewith. His sub-Just was the common house fly,
Musca Limestica
The first print gives a side view

the first print gives a side view of the problems as a whole taken with the 32 mm objective and with the 10x ocular. In the see md picture taken with the same expired but with the 16 mm objective are shown the labelle of the could fill be problems. labella at the cud of the probosers It is these that give contact with the surface upon which the insect fuds they are roughly semistraight edge The oval opining into the pharynx has between them I ach has a large pseudo-trachea parallelling the straight edge from which run laterally smaller branches. In all there

are 26 of these lateral branches Another view of the labelta showing the narrower end follows In the fourth view we have a small section of a large pseudo-trachea and parts of four lateral branches The pseudo-trained and parts of four fators of ranches Trained contributed the rings appear now to be fiexable bands, their ends not joined. Alternate bands have alternate ends burerated the lifurcations resembling claws and because of the alternation each branch pseudo-traches.







Photomicrographs of successively greater magnification and smaller field, displaying the structure of the house fly's proboacis

body wall, wholly covered with a meduas-like umbrella. The worms, including swimming and burrowing annulates, are represented in the Burgess faunce by a wary large number of fossil specimens, comprising nine-teen species, distributed through eleven genera and six families One of these has a head armed with tentacles, and the bedy divided into segments. It shows clear relationships with modern polychectes. There were ancient manufactes with spines, a development common

living approdited ar group of modern

# How the House Fly Takes Hold

How the singue Fty Taxes Host
THE attempt to discover how a "nucking meet
develops the necessity vacuum pressure for such
process has led to many investigations of their mouth
equipment. The probagate and the hypopharynx have
been analyzed ever and over again in this connection, and
special importance has been attached to the contact
totavens the probacate and the surface upon which the
insect feeds, or between the end of the hypopharynx and

The bifurcations on the branch pseudo-trackes, incation is indicated on the previous print

seems to have two rows of these claw like organs There are shout fifty of these to the branch making in all some twenty six hundred on the two labella This exposure shows still greater magnification being made with the 4 mm objective and the same 10x ocular

The final print was obtained with the 18 mm objectwo and the 10x ocular, aided by oil immersion and a lengthening of the camera bellows It shows the brur-cations on parts of four branch pseudo-trachea, Mr

Phillips suggests that the functions of the bifurcated hands as here shown up are intimately involved in the answer to the question which led the question water med him into the investigation How this fly 'bites, as many persons insist it does is difficult to explain unless there is a sharp hypopharynx which may be used as in the case of the female mosquito, the stable fly, or the horse fly Such a possibility seems doubtful, the shape of the proboscis hardly warranting any such assumption Yet the fly seems able to make a red mark on the skin of a chill and to constitute itself a distinct approvence to idults

# British Textile Industries as Affected by the War

The Measures Adopted by His Majesty's Government to Keep Up Supply and Holds Prices Within Bounds By Major H. Bannerman-Phillips

S 1Nt 1 August 1911 Great Britain has been impelled by the overmastering drive of circumstance, to an ever extending control of industry. As the military contentrating all efforts on the war grew more pressure section after section of industry had to be taken over, and in wages prices and profits, from raw material to finished product placed under government control 1 apr cally was thus the case in the textile field. The world abortage of wood which made itself felt

The world shortage of wool which mad itself felt at the hegmang of 1916 forced the government to take steps to ensure not only reasonable price but 1.0 meeting of the heavy demands for military clothing. The home wool clip of 1916 was purchased collection busy undertaken by expert buvons serving for the purpose under the War Office Proces were fixed after airful consideration at 35 per cent above those ruling in

e and July, 1914

The success of this scheme together with the very heavy neutral and American demands for wool led to proposals in November 1916, for the purchase of the Australasian clip This operation, involving an ex-penditure of about \$175,000,000 against \$37,500,000 for the home clip was carried out through the Australian and New Zealand governments which arranged a pur no rather less than 10 per cent below the ruling market figure Valuation and purchase in the colonies was entrusted to committees of trade experts appointed

by the colonial governments
The conditions which operated in 1916 made still more urgent the purchase on the same lines of the next season s British and Australesian clips and as the result of later negotiations a substantial part of the Nouth African clip was likewise taken over In addition to these outright purchases, measures were taken early in 1917 to bring under the control of the Armi, Conin 1917 to bring under the control of the Armis Con-tracts Department all other risw wood and wool products arriving in the United Kingdom. It is of course, to be understood, here and below, that measures introduced in 1916 and 1917 were continued through the

The wool acquired by the British government under emes is distributed, in priority, to governme contractors pro rata on contracts in progress and then, contractors pro rate of contract in progress and seen, against rationing certificates to manufacturers for the home and export trade. In order to stabilize trade and enable manufacturers to compete advantage-only in foreign markets, this wood is issued at prices fixed over periods of as months shead.

periods of aix months aneau

It became evident early in 1917 that the civilian consumption of wool must be curtailed considerably if the sumption of wood must be currained considerably in A Allied military requirements were to be met and an adequate reserve of wood built up against a prospective decrease owing to transport difficulties, in receipts A system of rationing manufacturers for the ordinary home and export trades was accordingly devised. The country has been divided for this purpose into districts which each receive quarterly allowance of the wool available for civilian trade based on their normal consumption allocation of the ration for each district to its man facturers is undertaken by committees appointed by the trade. The total of raw materials (alled for by approved applications is compared with the district ration for the quarter, if there is a deficit the amount to be issued against each approved application is reduced in proportion. The whole rationing scheme is supervised by the Board of Control of the Woolen and Worsted Industries com posed in equal numbers of representatives of employers, employees, and the Army Contracts Department, under the chairmanship of the Director of Wool I extile

There is no doubt that this control has resulted in great remer is no other that the control has resulted in great contonies to the state. Not only has the iffect of war conditions on market price of the raw materials been claimasted but the fixed prices have enabled the govern-ment to control the costs of productions at every stage. The Allied require ments of raw wood have so far as

sible, been satisfied by shipments from Australasia Large quantities were disposed of to the United States rument for naval and military use, in addition to a certain amount for civilian purposes, and provision was made for the wants of India and Canada Japan remade for the wants of India and Canada Japan received considerable quantities of merino tops made from woods combet in Australia Inpa, nois, wastes and yarna have also been frichy supplied the Luropean Allies, and every effort hate been made to assist them in keeping their wooden indestructive working as far as practicable

So much for wool. In other lines, with a labor supply

dininished by the needs of the army, with merecaing demands from Britash and Allied quartermasters, with restricted supplies of raw materials, the difficulty of meeting even essential requirements in certain instances meeting even essential requirements in certain material reducements of the entire output of the industry. If allowed to operate could be considered to the control of the country of the c

Defence of the Realm Act which it has seldom been necessary to put into actual operation. It has thus been possible to secure full data concerning costs and to insure that contract prices allowed no more than a reasonable rate of profit.

The prohibition of jute imports in February, 1917, was likely to lead to undus mission of the value of stocks, so all unsoid goods were taken over by the government on the basis of the market price prior to the emberce. the embargo. As necessity arose this jute was dis-tributed to manufacturers at uniform prices based on co t plus interest carrying and transportation charges Likewise although cheaper cotton substitutes were put in place of flar goods as far as possible the army requirements for the latter were large. In August the Ministry of Munitions took possession of the 1917 crops of flax, as well as of all other flax in the United Kingdom Purchase and sale were published without a license and maximum prices were fixed. (ontrol was also and maximum prices were fixed (ontrol was also established over the transport of flax from Russia Still another article lover which control was set is manila Still another a stele lover which control was set is manua-hemp. About 80 per cent of 1t consumption has been required for government purposes. In April 1917, an order was issued prohibiting all trade in manila-bemp and the government under frock its purchase and distribution for all purposes. It is distributed on

bemp and the government undertook its pureasee and darbibution for all purposes. It is distributed on arrival to ropemakurs at fixed pits which run about \$40 per to holow those rulling prior t roardro! In every tase the result of the summary action outhen has been estatfactory. Liquitable distribution has been estatfactory. Liquitable distribution has been estatfactory Liquitable distribution market prior has been estatfalled free from fluctuations. Competitive buying has been climinated, and the media profits merchanically all the media profits merchanically and the summarket prior private the media profits merchanically and the summarket profits and the summarket the undue profits previously resulting from private speculation have been done away with Above all, full utilisation of stocks without hearding his made it possible to stretch the supply so as to meet the essential demands

The serious crisis in the cotton industry which faced the country toward the end of I me 1917 was of a some-what different character. The difficulty of securing full supplies of raw cotton was one of shipping not one of actual under-production of raw materials. This side by side with the necessity for maintaining a reasonable standard of employment among large numbers of workers, mostly women who could not well leave their locality or be absorbed by other forms of industry led the government to take action. With the cooperation of the industry, a Cotton Control Board was set up. Steps were taken at once to prevent means of the Liverpool outton market and the main question of the dangerously low state of stocks of American cotton was attacked Production of the mills was cut to 60 per cent except in certain cases where a more generous allowance was made under a system of payment of levies. The sum thus utilised in safeguarding the interests of the working people in the less favored nulls prevented widespread distress which would otherwise have been inevitable Concurrently with great soon my in tonnage space an industry vital to Britain has thus been saved from parious dislocation

Before the outhreak of war the demands of the government for leather and leather goods were comparatively small, amounting to less than one per cent of the nation s small, amounting to less than one per cent of the nation s total output in this industry. At the end of the first year of war, those demands had increased from \$1,750,000 to about \$75,000,000 per year during the past 12 months of the conflict they amounted to \$100,000,000

of the commet say an inner or stor, out, our, out it became clear at an early stage that ordinary forces competition would not seeme the supply of materials any reasonable price. The army s demand was in at any reasonable price. The army's demand was in many instances greater than all the supplies in sight, many instances greater than all the supplies m sight, and, had a yetten of competitive tendering been maintained, prices would have risen to absurd heights. It was accordingly necessary to take such control both of home production and of importation as would reader it certain that these demands to most.

In the early part of 1917 the previously constituted

Advisory Commutee dealing with leather supplies was merged into a Central Leather Supplies Advisory Committee, which contains representatives of the oblid federations of employers and the leading trade unions muttoes which have met requisitly and given detailed advice to the central body. The relationship between the government departments and these Committees has been uniformly harmonious, and the existence of the Committees has contributed to the smooth running of the industry, providing, as they have done, an easy dense lobol fee criticism and for suggestion.

channel both for criticism and for suggestion. The large demands for sole and upper leather for military purposes, accompanied by the fact that for these purposes only the best was acceptable, embarrassed those engaged in the production of cirilian boots, while in aggregate the extent of production has not bess curtailed, it was thought soccessive during the summer of 1917 to take steps contring this Britains industrial industrial workers be adequately shed during the winter months Arrangements were therefore made, in consultation with the trade, for the production of war time boots. These have since been supplied in sufficient quantities to meet the demands of the working population, and they will be manufactured and distributed at controlled rates of

In considering the steps taken in the control of in-dustries, reference must be made to the organization set up to utilise unserviceable supplies Special steps have been taken to deal with all worn out textiles Garments been taken to deal with all worn out textiles. Garments condemned by military units are sent to a salvage depot Large quantities of rags are salved from all war areas Cuttings from material supplied to contractors for making up delting are assued as fixed prices to clother contractors. Departments and public bodes have been warned to occanomias in woolens and to forward for mational use all their condemned garments and rags. In solition, steps have been taken in conjunction with the gaussian contractors are contracted to the contractors of 
Arrangements were also made to deal with the a Arrangements were also made to deas with the saving of boots Boots fit for multiary wear are repaired for the purpose. The remainder are graded by prisoners of war under the supervision of trade exports. A system of research has been set up to inquire into the methods of research has been set up to inquire into the methods utilizing old boots and scrap leather in the manufactur of various commodities of which there is a shortage.

In general, it may be stated that efforts are con being made to encourage and arrange experiments to the better utilisation of waste products. Wherever, possible, these are used as raw material for the manupossible, these are used as raw maternal for the manuficature of goods required by the state, but when this is not possible, ordnary trade methods of disposal are induced into, and adopted if found to be advantageous. The amounts realised by the sale of such salvage during the 12 months were over \$7.00,000, and of course the saving in one not to be measured at all in dollars and contain the contract of the saving in one not to be measured at all in dollars and contain the contract of the saving in one not to be measured at all in dollars and contain the saving in one not to be measured at all in dollars and contain the saving in the savin

The statement of value is made merely to give some idea of the claure is provided to the cature in Further steps were found necessary, by means of a savage organisation within the army itself, to extend these operations to all articles of military use. At the amounts a Nakisma halvage Council was formed, many the product of the product of the control of the contro

# Why Does a Crankcase Breathe?

# How Alternate Pressure and Rarifaction are Produced by Apparently Balanced Piston Movements

LATTING a "breather in the createness of a four-sylvander gaschuse engine is a matter of some impor-tance. The alternate compression and partial vacuum taking place in the createness at overy revolution would tend, in the absence of a breather or vent, to force of out through the bearings and then draw it back, along with moore or less dust and foreign matter. The net result would be a very ofly engine exterior, and dray

remait would be a very oily engine enterior, and drty bearings.

This leads up, however, to sumsthing of a pussis, for either giving the master a little consideration one might will ask viry there should be alternate compression and partial resums in the crankonse. The crushit are set at exactly opposite joints on the crankonfart, two on made and even on the other theories there must always and an extensive state of the same and the same and the same and an experiment of the same distancer and all have precisely the same length of strokes, apparently, therefore, the displacement of air by the two descending part of pations. At that rate there would never be any change in the valued contents of the crank case and cylinders and consequently no change in precisions should be succeed to the control of the same remains of the same of the control of the same that there is a slight of the same of the same true that there is a slight of the same of the same true that the pations travel at eachly the same speeds in opposite directional? It is plant that the pation starts from a dead stop, gradually meadernate until it reaches the other dead center and stops before starting the return story the other same center and tops before starting the return

slows down toward the end of the stroke until it reaches the other dead center and stope before starting the return shocks, so that the motion is to some extent trequilar, but at not true that whatever one patton is doing any, on the down-stroke, the other is doing on the up-stroke? Curnously eneugh, such is not the rase. The truth is that the peston travels through the first half of its downward stroke—that is, the stroke away from the opinder hand—at greater peed than it served strongs the less half of the same stroke. On the up-

stroins the first half is performed more slowly than the second is moving more reported that a pattern making the first half of its descent is moving more rapidly than a pattern making the first half of its ascent, and displaying more art than the other makes space for with the result that the pressure in the straining the first half of its ascent, and displaying more art than the pressure in the straining pattern is obviously down while the ascending plation is accelerated, and the result is an increase in the total amount of space and a slight degree of vacuum. Thus there are two shanges in crankcase pressures at every reventure of the carakhaft.

At the bottom of all this is the angularity of the connecting rod—that is if st operature from the vertical in the case of a vertical engine or in any case the fact that the crank and moves alternately away from and toward the produced axis of the offinder. To explain the phenoms non let us connect the downward stroke. It motions of the crankprin is a compound of vertical and horizontal motions.

of the craskpur as a compound of vertical and horsaontial motions. It is clear enough that the vertical motion of the craskpur must be followed by an equal vertical motion of the pation to which it is connected. It may not be quite so clear however that the horsacnial moves must of the enaltypur-chait is its rawing out from the center line of the cylinder—also produces vertical move-ment of the piston which must be added to the other Perhaps the easiest way to explain the point is to imagini the connecting row with its imper and in the unital place in the piston but the lower end instead of being on the resistion acraised so that it could move only in a eranipin arranged so that it could move only in a straight horisontal line Starting with the connecting red vertical let the lower and be moved horisontally. The riguit will be of course a downward movement of the purton. The pourt can be practically demonstrated by holding a pencil vertical to the table and moving its lower and along the table, which will as set the upper end to be lowered

Thus the puston in following the first quarter revolution of the crank moves vertically through a distance equal to half the stroke plus the extra distance due to the angular

rty of the connecting rod this distant depends upon the length of the rod in proportion to the length of the stroke. In the sound quarter for the revolution the puston still moving downward the rank end of the puton still moving downward in rank end of the connecting not revenue to the recursor of connecting not revenue to the recursor of component and moves inwarf. Lepermenting with the priced it is found that coming lank to a vertial position raises the upper and. In the rane of the puton the virtual commonent is much great ritain the horizontal so the puton continues to move downward but the inward swing of the animal time real glows if down and shortize its (second that animals time real glows if down and shortize its (second time). the connecting rod slows it down and shortens its travel as compared with the distance traveled during the first as compared with the distanct traveled during the first quarter revolution of the trank Bradty while the erank goes through the first quarter revolution this parter makes sometiming more, than last its stroke. But the the orank goes through the account quarter the piston makes sometiming less than half its stroke. But the fly wheal keeps the crank turning at a speed that is constant throughout the volution and as a result the long half of the struke is done in precisely the same time as the short half.

In the first part of the up-struke the crankpin swing in the first part of the up-strukt the erankpin swings of from the centre, the results being the subtraction of something from the upward travel that there is a short strice just as in the last part of the down struk. In the last quarker of the revolution the erank is again swinging in and the addition to the v ritical compount makes another long stroke as in the first part of the down

strok:
Now for the breathing. The point is simply that when
one pair of pations is making a long stroke the other as
always making a lond stroke though the time is the same
for both. While the disacading pations are moving
faster than the ascending pations are moving
faster than the ascending pations move more
rapidly than the dewix oding pations arout move in
formed. So the crankease breathes even though a
superficial connectation of the mail'er majet makes's seen
impossible for such action to over;

# Correspondence

The editors are not responsible for statements a the correspondence solumn. Assumment so as eaunot be considered but the names of our estated to commercia who so desired

To the Editor of the Schmitter American
In your muse of November 22d, your article on "American Mining Medinery for Chosen brought out the
query as to when and by whom the name of Korea was

carry as to went and y work of current literature changed Although a farrly close student of current literature the name of Chosen as an entirely new one to me Serveral others to whom the matter was presented were equally ignorant Possibly a good many of your readers would lite to be enlightened on the subject

Quaker City, Ohio

(From cheeric MO A. D., the name of the country in quanties was Ears or Eurya, whence the fundher name Earn I. SER, when the last depacty was journeled by LeT-in, a cell cider name, Ohnem or Cheern, from the LeT-in, a cell cider name, Ohnem or Cheern, from the Chinese Chan-com, Morrange Presentase or Mercang Crim, ten qualitative and the company of the control of

# The faller's Point of View

To the Editor of the Somprises Assumana Justa his Bent in superch in an article stilled "The Shu Denous" Point of Tiere."

16. Differt's disputations shading the personning of Sometime gives carried in American adjus store the superint was featured by proving the Anna cognitions on the Southeast Southeast of the Southeast Will, I

ild like to say a few words as I think it is near time

would like to say a few words as I think it is near time that the public press would print the truth instead, and it is used as the public press would print the truth instead, and the truth series and provide American people are fetbis minded and cannot be the size of the truth series and the provide and the truth cannot be series and the provide and the truth cannot be series and series and the constaint series, and they were by law compelled to sail under the American flag prior the year 1917 were those in the constiting trends, and they were by law compelled to sail under the American flag as no forsign ship can operate form an American flag as no forsign ship can operate form an american part of the series and the season was due to the Semans Bill during 1916 to 1917 the fright rates for trans-Atlantic were ying and the shortege of ships due to the action of the enemy sauced a large amount of the hig ships of the Pedic Const to come east to the Atlantic Const for trans-Atlantic bride, and the smaller ships that were in the security trade of the Practic case Fast to will be accounted trade of the Practic case for trans-Atlantic bride, and the smaller ships that were in the security trade of the Practic case Fast to will be a supported by the Japaness new operates 50 30 per cent of the vessels and the Pacific Const.

American such as a College of the contract of the vessels and the Pacific Const.

to be sent trans-Atlantic Therefore you can see why
the Japanese trans-Atlantic Therefore you can be presented to be a
present to the Japanese trans-Atlantic There are not to the large of the dependence
as some of the shape would not be safe to stook the Rast
River. The hydrostate presume which is sailed for vir
the larve covering the Beam Boul to stook the Rast
River The hydrostate presume which is sailed for vir
the larve covering the Beam Boul to the sailed for vir
the larve covering the Beam Boul to the took of the Larve
the descript part, thardow preventing the loss of
few lives. The dance in the Seamon Bull which takes
that 75 pre cost of the term must be able to understand
the English language is just lacking 35 per eant of what
it should be The Stanting that of Mr. Dollar less in the
fact that the disease of the Seamon Bull stating that be
can draw half of the wages in superstoon of drink when the
work in the stanting that the control of the Stanting that the
cover in made of a hundred per cent Americans. I as a
Chief Enginese can extilifying state the only time I have
had any trouble with any men drinking heavily was when
I had foreagees at the Stanteser. Department The
average American asspian is made of better stiff than
the and one be retired apon to come book to the she she control
in the Stantese State Stanteser. The stanteser of the drink
Now this is the opinion of another who sees the other

ade of the situation and which should also be printed so that the people can are both sides of the story JOHN I PETERSON

thef Pageneer Marine

New York, N Y

# How Will the Gasoline Engine Develop?

How will the Canoline Engine Develop?

To the I dater in the New Private Amenia As
I have raid with introde Howard Warren a article in
your news f March 22d 1919 in the that this Ma amonates and I have dust some work along the heat from the susaping gases to go nerate steams
to be used in auxiliary power and have shown results
worth the installation in stationary engines. But whose
waterment it apply that is automotive augument of the property of the stationary engines. Our present
found many difficulties to be oversom. Our present
design is as follows:

A small builer is mounted as a substitute for the exhaust manifold and water from the cosing system is schass' manifold and water from the to thing system is pumped into it so as to manifan a steam pressure of 500 pounds when the engine is running. The steam is 500 pounds when the engine is running. The steam is conveyed to a turbine mounted just lack of the transmiss in and attached to the drive shaft the exhaust team is conveyed from the turbine; to the ratator and when tundensed as a part of the moting systems. The water in the cooling system is kept at a little below the boining point. The furthers has a greater speed capacity that the state of the state

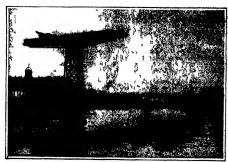
A J LOWARDS M D

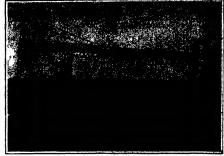
Pine Bluff Ark

# The Skip Step Does Not Always Work

To the Editor of the Strawyer versa. It note in your uses of December 14th page 472, the steement that its e p stop system has not assumed that the e p stop system has resulted in a great saving of coal and turns of the strawer of the United Rainwystements where the president of the United Rainwystements where the statement that the United Rainwystements where the statement that the United Rainwystements where the president of the United Rainwystements has not rathled in an approached and the little time sawed as more than made up by the moonweauence caused.

CRAWDS H HALL JR.





Brest harbor showing big crane and (in background) swing bridge

The transfer bridge between the two parts of the Brost greensi

# War-Time Construction in the French Naval Arsenals

The French Yards and Arsenals Concentrated on Army Ordnance and on Anti-Submarine and Special War Vessels By Robert W Neeser

A RECINI communique assued by the Ministry of Manno contained some important announcements on topics which have been inherito haunced by the contract of the manner of the manner of the armonized that of the signing of the armonized the 11 per contract of the signing of the armonized the 11 per contract of the signing of the armonized the 11 per contract of the signing of the armonized the 11 per contract of the signing of the armonized the 12 per contract of the signing of the 12 per contract of the signing of the 12 per contract of the 12 per c convoy and patrol duty 130 submanne chasers and 192 mine sweepers not to mention 70 smaller craft available for harbor dispatch service

It is an axiom of naval warfare that each conflict on the It is an axiom of naval warrart that each conduct on the high seas witnesses the creation of a new type of warship in this war not only one but several classes were pro-duced to meet new conductors and when note is made of the number and variety of the anti-submarine vessels attend out for the French

navy a more adequate conception is had of the immense effort made in the arsenals of the Cinque Ports during the con the fact that since the very first day of the mobilization in 1914 the navy yards had been obliged to meet the requirements of the army on shore as well as the needs of the forces afloat

In this connection the following list of the material manufactured by the various naval arsenals for the Ministry of War between August 2d 1914 and Novem ber 11th 1918 is not without interest 8 500 guns 7 000 parts of guns 1 600 gun Shoo gains 7 000 parts of gains 1 000 gain carriages 80 000 carriage parts 30 000 000 brass shell cases 31 000 000 shells 600 000 trench mortar bombs 39 000 000 rounds of ammunition for field pieces 80 000 000 parts for fixed ammunition 36 000 army wagons 3 500 000 parts for tents 1 500 000

wagons 3 out our parts for tents 1 700 000

rift parts not to mention hundreds of U.

tanks both large and small The navy

awtd nur lift at the beginning of the war

wrote (cloted Payeur to the Inspector-General of Naval Constructions for we did not know to whom else to apply for all the material we needed

From the day that the true memore of the submaring for we did not know to whom else to

campaign launched by Cermany was realised every effort was made by both public and private shipbuilding plants to meet the extraordinary demands made of them for the speed upput and equipment of new vessels. In 1916 twent two 350-ton gunboats were laid down During the war following ax avisos (650 tons), ten 850-ton gunbasts thrty-one patrol vessels (470, 535 and 677 tons) and ax vedettes (25 and 40 tons) were d, while in the first ten months of the year 1918 launched, while in the first ten months of the year 1945 five gainbasts 79 patril vessels four avisos (370 tons and 5,990 horse-power) (in vedettes four mine sweepers (720 tons and 600 horse-power) and three dispatch boots were added to the navy last a grand total of 177

vessels of all types aggregating 69 665 tons and 153 050 horse power. This construct in was divided among the public and private shippards as follows.

| ) ear | Tonnage built in<br>naval arcenals | I age built i<br>pr vate yards | T stal |
|-------|------------------------------------|--------------------------------|--------|
| 1916  | 5 600                              | 2 100                          | 7 700  |
| 1917  | 5,655                              | 12 755                         | 18 400 |
| 1918  | 7 615                              | 35 938                         | 43,558 |

When one considers the difficulties which had to be writes our consistent these results the effort made for the production of naval construction in France seems truly unexampled. The lack of skilled workmen, the mobilisation in 1914 having roducel the number of men employed in the arsensis from 10 000 to 4 500, was a serious handicap at a moment when every shippard was called upon to make its maximum effort. The failure of

years The seventh and eighth series (183 vessels) were under construction when the armistice was signed Not only were the establishments in France appeals: to but those in the United States Japan, Canada, and Great Britain ware likewise drawn upon One hundred submarine chasers built in the United States crossed the subnarius chasers bulk in the United States crossed the Atlantic under their own power or were transparted on the decks of merchant ships Twolve vedetises of the Vickers type were bulk at Quebeo, nite 1,250-box sloops and 40 vedeties were ceded by the British government, while 12 seaging torpode boxes (600 tons) were con-structed in Japanese shipyards for service in the Montzer-ratean. To the above should be added 17 amili travelers ranean To the above should be added 17 small trawlers built in Spain

In the descriptive accounts of the operations of the

French navy which have been appearing during the past few years, the names of the different units added to the

From the navy which have been appeared to past the past of the wears, the mass of the directed units added to the regular naval force have not been measured to the revenue of the direct to the regular naval force have not been measured to the revenue of the regular naval force have not been measured to the revenue of the results of th



U. S. S "Mt. Vernen" in dry dock in French navy yard at Detail

the steel works at 8R. Ethems to doliver all the plates and cartings demanded of them and the shutting down of the Riccatt and Alexen Sectors upon which the navy depended for its supply of boiler tubes, not to mention the delays attending, the delivery of the meablesty ordered in England (these delays often extended over a period of 18 months and retarded the completion of also factors which complexed a situation made critical by the short-age of testasportation and the losses by toppedoing of shipments of maternal ordered abroad. The damand-file-engancy assump story turneds and avisos was met by Welding these each in series or programs, in order that selds concerning the months of the contraction of the state of the contract of the contrac

# Lake Michigan's Encroachment on Its Coast

# How the Carrents are Stealing Land from the Western Shore and the Giving It Back at the Southern Extremity By Hu Maxwell

DURING 4,000 or 5,000 years the waves of Lake Michigan have been encreaching on its western show from the lodician state into northward into Wincombin, and within that time the waters have pounded made and within that time the waters have pounded not not to the property of the property

In most places bluffs, ranging in height from a few feet to 70 or 80, constitute the shore and the waves of the lake make their attacks against the bases of these bluffs. The soft material crumbles, slides into the lake and disappears Canual observation is sufficient to show that the process is rapid in some localities and slower in others while in a few places the shore is holding its own, without any assistance from man, and has not recorded any in

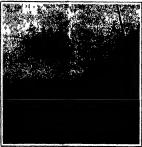
Public land on the western coast of Lake Michigan Fuller and on the weetern construction in the district under consideration, was surveyed about the year 1835 and monuments were set up at that time at various points to mark the survey. These monuthe year 1835 and monuments were set up at that time at various points to mark the survey. These monuments now furnish the means of estimating the rate of the lake a encreachment upon the land. The advance of the water and the recession of the above may be measured, and the average may be calculated for a period of approximately 80 years. The rate of recession has wared greatly in different localities, due to local influences, such as contour of the shore exposure, form and material of the banch and the set of the currents, but the average for the whole period since 1835, calculated for 180 miles of shore line port-band from Chicago, shows that the water has sent-cached upon the land only a little less than three feet a year.

less than three fact a year During single years the inroad at certain points he een much greater than that A strip of land 16 feet sep along a part of the campus of the Northwestern Geep along a part of the campus of the Northwestern University at Evanston, Ill, has been washed away in the space of 12 months, and a similar rate has been noted at the point where the Wisconsin-Illinois line meets the lake In other localities little or no encroachment is now taking place At Waukegan for example, the she line has been stationary a long time

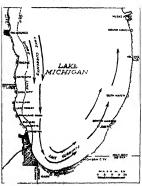
The question naturally suggests itself During how long a time has this encroachment of the lake upon the western shore been going on and where was the be-

Data worked out by the Coast and Geodetic Survey for the government help to answer the question Lake soundings reveal a submerged plateau or bench along that

part of the shore which is here under consideration. The water which covers this bench is shallow, ranging in depth from 30 to 60 feet, and the plateau extends out from the present shore several miles—two or three in



Rapid destruction of the lake shore at Bracelde, Ill



at and furmer above line of Lake Michigan Correct that have piled up all this land at the accellate and of the lake

some places and as much as eight or nine in others Beyond the outer edge of this plat u the bottom of the lake pitches abruptly down several lundred feet

That bne marking the division between the shallow and the deep water is evidently in the place where the old shore once stood. It was the coast line of the lake before the waves began cutting back into the land.

The submerged plateau or bench represents the area of encroachment about 600 square miles as already stated

Here is a basis for an estimate of time and if the figures an correct even within a pretty wide degree of approximation they seem to bring the ice Age considerably nearer to the present time than it has been generally At any rate it is interesting to take the encroachment as a factor and see what the result is

Assuming that the rate of recession during the past 80 years is a fair average for the whole time it may be shown that Lake Michigan began its attack on its western coast about 4 700 years ago. I hat was about the time that ( heops king of Egypt set his slaves to work building a pyramid to perpetuate his memory not know that any human beings lived on the shores of Lake Michigan at the remote age. The bluff deposits along the lake have not yielded any human relies of fossils though there is little doubt that a few principalist Indians had followed the retreating ice of the Glacial Age northward and were on the lakes shore even at that remote time. But whether such was the case or it has nothing to do with the geological question involved

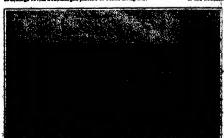
Interest in important occurrences though remote should lead one to inquire why I ake Michigan should have commenced cutting away its western shore at that particular time for it is as certain as a geological fact can be that the lake was there long before. Why did it not bugin its attack before!

The cause for the commencement of activity at that time is known with reasonable certainty but the evi dence is geological rather than historical

The lake s surface it is believed mached its present level at that time and then began the attack on its shore which has been kept up ever since. Before that period the level of the lake was 50 or 60 feet higher than at and the surplus water of the lake flowed away toward the Messissippi through a river whose channel remains to this day high and dry westward from the southern end of the privant lake. It is supposed that the water was held at that high level by an ice gorge or a glacer which prevented escape by way of the 5t Law rence vality as the lake is drained at present. That condition doubtless existed many thousands of years while the Glacial Age was drawing to a dose. Finally the ne obstruction gave way the imprunded waters of the Great Iakes flowed down the 'st Iawrence valley Take Michigan sank to its prient level and it was then that the water began to wear away the shore. Apparently the time has not much exceeded 5 000 years since drainage to the Mississippi ceased and the lakes present level was fixed. The old drainage channel was forested over or grassed over when white men came but it was so evidently a liver channel that it was recognised as such by the earliest pioneers men who had no knowl-

edge of geology

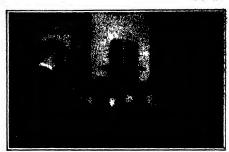
The destruction of land by Lake Michigan has been







Storm breaking on the shore defenses of Northwestern University campus





Receiving long-distance messages by means of vacuum tube detectors shown at right.

Ameture at work installing their serial, shortly after the raining of the Government ban

## Amateurs in Name Only

A Story of What the War Has Done for the Cause of Amateur Wireless

By Austin C. Lescarboura

It is no simple matter to explain why there are several hundred thousand surviews amuteurs in the United Btates today. It is difficult to understand why a young man should place his bard-asmed asvings in an elaborativaries of the strated of a motorcycle or motorboat. It is pussing to find boys young men and oven siderly men spending hour after hour of spare time patiently adjusting the knobe of a collection of instruments while listening to long and short buses and whatle like notice

worn on the head

Yet the fact is that the wireless amateur exists—and in vast numbers. Lven two years of enforced suspension of this hobby, due to war regulations has only served to stimulate interest in amateur radio Indeed not only are all the old wireless amateurs reopening their wireless stations, but many newcomers have entered the field. The numerous important advances made in wireless telegraphy and telephony, made in wireless telegraphy and telephony, and the startling application of these methods of communication, have served as nothing else could serve to stimulate a broad interest in this strange hobby

#### Kilowatts on One Hand, Microwatts on the Other

What makes radio communication so fascinating? Perhaps the answer may be found in the super-eavosdropping feature— For instance an amateur possessing a high grade receiving set can, while sitting in the attic of his home in the suburbs of New York listen to the messages from coast stations steamers battleships and even the powerful wireless stations of Furope By the manipulation of several knobs he can tune in with

the Liffel Lower at Paris, the station at Lyons, the enemy station at Nauen in Germany and the station at Rom lie is in tools with the important centers of the world, and he receives important receives of the world, and he receives important press depatches long before thy appear on the builten howdra and in the newspapers And all this without leaving his chair in the attuAt the present writing the Covernment ban has been raised on receiving stations only and the time has not account of the property o

yet arrived when an amateur may operate a transmitter

N response to many requests on the part of readers of this journal there has been prepared a special series of articles on the broad subject of amateur wireless telegraphy and telephony. This series, which will appear regularly in the Scientific American Supplement and which begins with the usue of July 5th, No 2270, constitutes a practical working guide total to work. It is non-technical, yet it covers every important phase of post bellum amoteur radio. Its authors are Louis Gerard Pacent and Austin C Lescarboura, both of wham are well known to the radio amateurs. of the country —THE EDITOR

> However it is now but a matter of weeks or even days when the ban shall be completely removed and then the air once more will be crowded with amazur messages passing back and forth Obviously a wireless station is not complete if it cannot transmit without a transmitter one can listen without aver answering or question. ing but with a transmitter one can communicate with distant friends and acquaintances and earry on a regular

Still these matters of super-cavesdropping and con-

rezung through space do not quite cover the fasednatum of ratio communication. There are assatsure who devotes most of their time to wring and seventing and arranging and rearranging their apparatus. They suit all sort of queer contexptons with which they appeared by the hour, testing them for receiving or sending as the case may be These anatheurs, no doubt, are fasemated by the intenselse and mywherke of electricity as applied in adult work. One does not begin to appreciate the marvals of electricity and one delves into radio communication, where on the one hand to current its handled in kilowatts for the purpose of transmitting over longer of the purpose of transmitting over languages while on the other its intercepted and passed through the receiving entit.

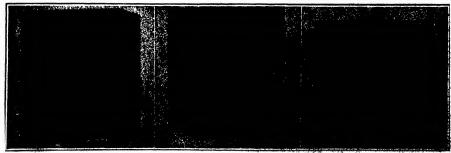
apparatus in volumes only measurable in improvatts or millionths of a watt, a watt being the electrical equivalent of 1/748th

of a horse-power

Then there is the matter of the inventive

Then there is the matter of the inventive impulse. Radoo communication is rich in possibilities, in truth, more than one commercial score in truth, more than one commercial score in truth, more than one commercial score in truth, in the commercial score in the principle of the leading engineer in electrical and viroless organizations began their carross and the commercial score in the co

full-fiedged wireless amateur



The first and second views show the exterior and the interior of a receiving not, while the third shows a vacquest take unit

thuted a number of inrations. Not the least portant of these is the le application of the application of the vasuum te mployed by the more proive amateurs in pre days, is now used for trans-mitting as well as receiving The vacuum tube is nothing more than an electric lamp of the incandescent type, of the incandescent type, containing one or more elec-teredess in addition to the filter of the continuous of the execution electrical characteristics electrical characteristics electrical characteristics electrical characteristics and these have been supplied that there exists and these filters are employed for detecting are employed for detecting the weak nursuants induced in the weak currents induced in the receiving set by the distant transmitter, for building up or amplifying these

weak currents in the event that they are too weak to be heard in the receivers after seast time are to weak to be near in the receivers at a passing through a single vacuum tube serving as a so-called detector, for generating high frequency currents used in transmitting wireless telegraph or telephone messages, and for modulating powerful currents by means

messages, and for modulating powerful currents by means of relatively weak currents.

Vacuum tubes are so much more sensitive for receiving purposes than the former crystal and other types of detectors that most amateurs will use nothing clse. At least, an amatour may start with the far sumpler inscae, an amount may start with the lat simpler in-struments for receiving, but sooner or later he comes round to the vacuum tube receiver, just as the man who starts with a \$500 automobile often climbs by easy stages to the \$7,500 car. The simple receiving set, costing but a few dollars, may serve quite satisfactorily for recoving messages from nearby stations. However, when the amateur wishes to keep pace with other amateurs who are in daily touch with European, Central American, and Padio Coast stations, he must purchase the very

and Padine Come seasons, no must purchase the con-best apparatus for the purposes. The vacuum tubes have made wireless telephony practicable and relatively meropanive. Heretofore, the continuous waves required for wireless telephony were usually generated by an electric are, with all its attendant usually generated by an electric are, with all is attendant rotubles such as heavy cutrent consumption, elikekring, fluctuating oscillations, microphone troubles and so on Today, thanks to the vacuum tubes avaisable, wireless telephony comes well within the reach of the average manteur A simple vacuum tube may be used together with some form of inductance, capacity, simple microphone, motor-quentrois set for supplying a bigh-voltage directs current, and other accessible to the supplying a bigh-voltage of the supplying and the supplying a single voltage of the supplying and the supp



mobile or motorboat, so that he may keep in touch with his home or office and with other stations Another mnovation brought about by the war is the loop. As its name indicates this device is simply a loop consisting of numerous tirms of wire. For amsteur use. consisting of numerous titrus of were For amateur use, the loop may consist of 12 turns of heavy were with the turns spaced 1/4-inch apart and if one desires to receive from long-range stations, the loop may be wound with 40 turns of wire The loop serves as the aerial for re-ceiving or sending. One side of the winding is attached to what would ordinarily be the aerial connection, while the other is attached to what would be the earth con-

The loop, which is shown in the cover illustration of The loop, which is shown in the cover illustration of this uses, simplifies the smatters problems. It used to be necessary to erect high poles between which were stretched the wires forming the aerial system. But, owing in large measure to the extensive use of vacuum owing in large measure to the extensive use of vacuum tubes as detectors and amplifiers it is now possible to intercept wireless waves with a simple loop placed in a room. Almost he end of interceting experiments can be carried out with loops, for those wave interceptors have marked characteristics such as direction finding and miterference prevention. A loop enables one to be one more than the property of the control of the long more property of the control of the control of the long more property. Seterime the direction from which bass of the radio ompass used by vessels and aircraft. Again the loop diminates much of the atmospheric electricity or so-called "statu" which has heretofore interfered with long-distance wireless reception.

#### Getting Along Without Anten

Some time ago the technical press brought out the details of an underground system of receiving perfected by an American during the course of our participation

in the world war This system makes use of a burned antenna, and, aside f in the convenience incidental to doing away with elevated wire systems climinates most of the static interference taki: g plac in the wireless world i out which the amateur is not immedi tely informed it may be safely assumed that numerous amateurs will resort to thu amateurs will resort to this system or a modification of it As it is, for years ama-teurs have made use of ity gas and water pipes for antenna and ground purposes respectively Truly, there is very little that anisteurs have not done by way of getting round the antonna problem, especially when confronted by a landjord with very little symsenner-in the radio direction, at least Fire-escapes, bell wiring metal bedsteads, telephone lines and electric power lines tapped through

680

a condenser so as not to interfere with the electrical arrangements—these and nany other improvisions have served as antennas where

While almost any metal mass will serve as an antenna for receiving something more substantial is required for transmitting signals. As soon as the ban on amateur transmitters is removed there will again appear the masts and elevated wires on many of our city apartment houses and country homes

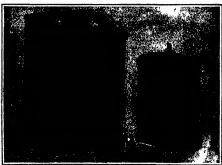
houses and country homes
Turning to the question of apparatus one finds that
a marked step forward has been taken In antebellum days almost anything went as wriceless apparatus
In fact, nune-tenths of the Amateurs made their own
apparatus from odds and eads, and opparating convonience counted for next to nothing But when the
war called many of these same amateurs into the inavil and military service they became acquainted with com morcial apparatus and soon forgot the home-made material and crude apparatus generally sold some years back. At present these so-called amateurs who have been serving in a professional capacity for the two years of our war are coming back into the radio experimental field with professional ideas as to equipment. They are demanding the same grade of instruments as they used in the (levernment a rvice and they are getting it

Pre-war amateur wireless equipment was made mostly Pre-war amsteur wireless equipment was made mortly of wood for mounting the metal parts. Cheapness was the paramount consuderation. Typewriter knobs were used for manipulating the various components, plain switches, stock binding posts, cheap mickl-plating. So much for the outside—the only part that showed, and it is left to one a imagination to determine what must have been the condition inside—the part that did not abow. Still what could one expect when the price was

(Continued on page 700)



Butter condenses of the bigiest type, thewing the specialty members



Variable infratance of the variemeter design, showing the fixed and movable colle

#### Mud Geysers at Salton Sea By Charles Alms Byers

ON the east rn shore of Salton Sea about set n miles from the small town of Nilas I (al there recently has mul genera. The field covers at present an area of a little more than two acres and comprises a conparatively level expa save for the geyser n unds themselves from which the water f this unnatural mian I sea has gradually recoded as the result of rapid evaporation. The area is already pute liberally lotted with the mounds and new ones are from time to time being adde

mounds and new ones are from time to time being added into one-alled govern in mud volcanors somewhat recombing huge crawtah houses are varousessed that the second of the and seem will shoot right in the air. At su it times a strong smell of sulfur or alseme is noticeable. These explosions are naturally occasioned by the gradual ac cumulation of peckets of gas and so terrific is their force that they sometimes have torn holes in the earth from 4 to 10 feet wide and to a depth of 10 or 12 fe

The govers frequently first appear as small spring like fissures from which the mud bubbles but intermittently and some f them seem to develop into nothing more Others either through gradual development or by suddenly springing into existence with a loud explosion become great pot-shapid caldrons some of these having finally by the steady overflow or the successive spout ings of the mud built up about them mounds as high as

Salton See on the shore of which this field of mud Sation Sea on the store of which this held of muse gaysen is located was until about 15 years ago a dry salt-encrust d area known as the Salton Basin or Salton link with a maximum of 265 feet below sea level In the latter part of 1004 the Colorado River entered upon a series of high water rampages and as a result tempor a series of initial water rangesce and as a restart support and youngerted a large irrigation canal which tapped the stream and supplied water to several thousand acres of fertile farming land in the Imperial Valley into a veritable river. The water thus diverted into the vertable river line water thus diverted into the irrigation canal sought out the lowest depression within reach and hence poured into the Salton Sink After about an unsuccessful attempts permanent control of the canal and river was acquired in the spring of 1906 but in this interim of more than two vears the hithertodry Sink became a large lake embracing an area of about 400 square miles

about 400 square miles
Since the stopping of this inflow of water from the
Colorado River Valton Sta has been rapidly shrinking
through infansive evaporation. In ten years for in
stance the lake recorded to about 93 000 acres. Scientsets claim that this shrinkage will continue until 1928 when if the present rate of inflow from two small feed rivers is maintained, the lake will be a permanent stationary body of water covering between 40 000 and

The present field of mud geysers is the reappearance of a similar field which existed prior to the lake s formation though the area they now cover is larger the bubbling mud pots are much more numerous and more active. The report of the United States Geological Survey for 1902 for instance mentions four mud volcances southwest of what was then Imperial Junction and is now known as Niland They

are explained in this report as fissures extending from subterranean bodies of steam similar to those in Yellowstone Park but not so active.

The mud is created by the falling into this steam body of the fine sut forming the surface amend of the fields Nicks crust of the Salton Sink

crust of the Salton Sink
The reappearance of the mud geysors made
possible by the recognion of the water from the
area, after boug submerged for about 13
years occurred during the early part of 1918,
presumably as an accompaniment to rather
evere earthquake disturbances in the winds? A number of milder shocks have occurred sin then and during such times the govers show a

#### New Lead-Burning Transformer for Storage Battery Work

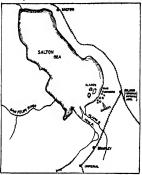
THE most modern method of burning terminals in place on storage batteries. termenals in place on storage batteries, up posts, or in fact almost any form of lead w is to do & electrically—by the electric welding



the new field of mud comes built up by poyor action in the Salten flink when that busts was resided by eartheurises

The last word in elsedre lead-burning equipment is shown in the accompanying illustration. The transformer of the set is designed to be connected to the ordinary 110-voit alternating current lamp socket, a 10-foot cord with plug being provided for his purpose. This attaching cord is prefected by a special rubber covering against the hard wear durt and acid with which has been considered in the contraction of covering against the hard wear dirt and acid with white it may come in contact. Connection to the transformer itself is made by means of a plug and socket connection so that this plug can be used in place of the snap-switch in the lamp socket for turning the current on and off

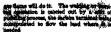
red terminal leads are used Two separate rubber-cove



Map of the Salton Sea showing the location of the mud goysers

to convey the low voltage heat pr slucing current to the parts of the battery to be welded. The lead having the large clip is fastened to the battery plate or post which is to be worked on. The other lead has at the end a carbon holder which is arranged with a heavily insulated handle so that the operator's hand is guarded from the heat The carbon holder takes any ordinary are welding carbon

The carbon holder takes any orthinary are wedding carbon this carbon forming the second terminal. When the pointed are welding carbon is brought into contact with the lead the pointed end of the carbon becomes intensely hot so hot in fact that it nielts the lead over a restricted area quicker than a pointed



shirting the advantagement the lead burner is that regard work in ground correct such to despect more a table has in always rights not the poin surface, the division is readily wrighting approximately; 35 postudi is not have to be eleaned as the alag notomatically rise to the smith alag notomatically rise to the smither while deanneed. When properly is

while described When property is no glare to injure the operator's eyes, as he is on the cool and of the carborn is such a way that point where the carborn touches the lead is he view. There is no danger of electric shock

view interes is no canger of accessors assout coccases of efficients insulation.

On the basis of 10 cents per kiloweth hour, it cents about sight cents per hour for oursets when the sevice is operating steadily. The instant the carbon point is removed from the work, the ourset consumption prea-tically coases at the device takes then only 4% water from

the line Owners of these transformers have found an interesting field of application. The device is said to be especially valuable to actionable owners in reconstructioning and repairing storage batteries. In the shop and foundry it has been used where all inted of odd siddering jobs must be done. The device has also been found applicable in plumbing, reoling task building site.

### Classifying the Stars by Mondelieff's Law

Classifying the Stare by Mesodelled's Law THE stars are usually divided into a principal classic according to the spectra they exhabit, as follows Class O stars of the Wolf-Rayet type, B, belliom stars, O stars of the Wolf-Rayet type, B, belliom stars, M, order of the most characteristic substances and the star of the most characteristic substances in the beautiful control of the star of the most characteristic substances in the spectrum yielded by the light from the star. It is now proposed according to a writer in the Reme Sessenfique (Paris) to make Memdelled's Law the beast of Cassification This well-known law divides the abmentary or simple subvisances into sight classes, such or which contains bodies with indisputably analogous properties. The following table shews the first three members in anch class, the valuones with respect to hydrogen being indisorded by the numbers at the top 8 3

0 He Ba Mg Ca Bo Al Ba N 0 Ñe Ų. Ag

Evidently it is quite feasible to piace each star in that one of these cight classes which contains the element characteristic of its spectrum. By nankogy with the theory of fir Norman Lockyer it may be scoped as true that the multivalent elements tend to dissociate progressavely in proportion as the size it may be scoped as the that the multivalent elements tend to dissociate progressavely in proportion as the size increases in temperature. The maximum temperature occurs in this stars characterized by helium, an element whose valence as 0 then under the influence of a lessuaing temperature the atoms recombine and an increase in valence causes.

valence coasses

The evolution of a star, beinequently, proceeds
the right towards the left of the above table, the b
aluminum group being the alle mengher of this cas
development, and the earbox-afficien group the





Burning sects on a storage buttery with the new transfe

Carlo

Dirigible constructed by a French sirship builder for the American Army

#### & Dirigible Armed With a Common

WAT may be considered another revelation of " a another revelation of the great war is the diruphle shown in the accompanying Businations. This drugble, of the Eodina type, was con-structed for the American Army by a French builder of lighter-than-air type air-I lighter-than-air type sir-raft, and is armed with a issa-inch quick-firing can-on, as shown. In the absence of definite

is, the length of this sirship appears to be about two hundred and fifty feet. The

sacoule or oar is said to be armored, at any rate, it is unsusually roomy for a dirigible on such small saie. The power plant consists of two engines, placed on either side of the fuselage, as shown in the second disstruction on this page.

The cannon leads one to be was intended for combatting sheve that this dirigible



MEASUREMENT of metallic objects to as-certain their exact size and shape ordinarily takes a mechanical form. To be it would usually be ble to find wheth possible to find whether as netallic part were too large or too small by attempting to put it in the pisce pro-vided for it, or by trying to use it for the intended pur-pose, but seldom would this process show just where and how great any disorepancy might be. er a

might be.

In the case of glass lenses
and murrors, however, the
reverse is the case. These
are intended to reflect or
transmit light; and the reflected or transmitted light;
is visible Morover, it is
visible Morover, it is
visible Morover, it is
visible and alone as a whole,
but with reference to the
rays that comes from each
point of the glass. We can see the glass work, and see
just where and how great any discrepancy in its working
if, it is possible to test the glass by actual performance
This does not necessarily involve even removing the
piece from its work.

a from its work peace from its work-ing position on the grinder or polisher Thus, in the manu-facture of the para-boloidal mirrors for

nemit light to a

formance of the marror is shown in one of our cuts.
The other picture illustrates a second test which has
to be applied to the scarchlight reflector before it is
accepted by the Government A large carboard screen

Secolie of the American Army dirigible, showing the quick-firing cannon up front

de American army dirigities, showing the quick-firing cannon up front in that circle Under this form on take place with the property of the pr

local fault in the grinding of the nurror. If however a glass passes both the tests it is satisfactory and goes at once to be silvered

An tir interesting de velopi et which is to be secr in the 1 p at the first of 11ftl Street where many of the sarchlight reflectors for the Government were made during the war is i circular-parabolic mirror. The convex side of the big glass which takes the motallic reflecting film must of course le parabolic But there is no parti ular reason other thin custom why the inner one should be ground to a paraboloidal form When

Army to a parabolosistal form. When it is no ground the mirror us naturally of uniform thickness throughout the same amount of glass is found near the center where there is little or no danger of breakage as at the ciges where this danger is present and has to be guarded against Hence the narror is very weighing at times

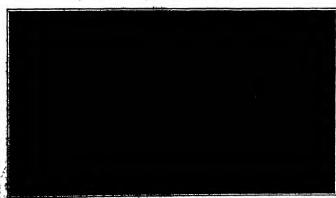
werst hundred pounds

The new idea is to grind the inner concave surface in the form of a spherical seg ment The radius is so glass are of the necessary thickness while at the center the sphere approaches much closer to the parabeloid sur face than before This is feasible because so much of the central segment of the paraboloid as is used for the paraboloid as is used for the mirror is flatter than a sphere of comparable size Of course if the two sur-faces were extended beyond the eirck that bounds the mirror since the curvature of the circle remains constant while that of the parabola increases quite rapidly beyond the immediate vicinity of the vertex the sphere would soon run through and outside of the paraboloid but this

tor that a 60-inch ri flector made after this scheme weighs barely 70 pounds, two men one at either side can move it about without knowing that they are lifting anything, and hence with no

#### Under-Water Storage of Loga

STORING logs under water will prevent blue stain, checking insect attack and decay (The logs would of course, be subject to marineborer attack in salt or brackish water along the sea coast where these pests are active ) Wood of any species com-pletely subnerged in water will resist decay indefinitely wetting and drying, how-ever favor decay



erablight restorate. The rided serven must be visible the paint proper State in the smoke-class produced or the

## The Heavens in July, 1919

## The Dimensions of the Universe, as Indicated by the Milky Way

By Prof. Henry Norra Russell, Ph.D.

As we stand on a dear mornless summer night and face southward we led ild one of the most remark a line southwaru witting one of the most runary asho of seismal spectacles. It is not to be constillations of summer that this statement refers they are indeed conspicuous and contain many stars which are very runor and of great brightness but even the most distant of the stars vanile to the unantid eye of run but the foreground to the greater picture with with we have now to do. It is the Milky Way win his after all the dominating feature of the summer ak. As we follow its mighty arch from the northern to the southern horizon we notice at once that in it is northern havens in Persons and Cassiopeia it is relatively faint that it becomes much brighter overlead in Cygnus and that to the southward between A 41 ha and Engittanus and in the latter constellation it is extremely bright and full of clouds and patches of light

A second mere careful giance suffices to show that in addition to this brilliant str im of light there is a second and fainter one parallel to it and lying to the westward (or to the right as we see it) Tracing the two back to the northward we find that they run together somewhere overhead and that the northern Milky Way,

somewhere overhead and that the northern Milky Way, though irregular in outline shows no such double structure. If at some other asson of the year, we observe the part of the Galaxy which is now below our bear to the Galaxy which is now below our bear to the control of the Galaxy. which is now below our horis in we find that it consists of a single stream of ir regular breadth relatively faint north of the equator in Auriga and Gemini then brightening a little but remaining single to the southern horizon. In more southern latitudes where the part of the Milky Way which is invisible to us can be seen it is found that on this side of the heavens too, it brightens up greatly in southern declina-tion. Though in Orion and Canis Major it is relatively poor in Argo it becomes brilliant and this more conspicuous region extends on through (entaurus and the Southern Cross until it joins up with the bright region in Sagittarius. The two branches of the great stream of light which are lost below our horison in Sagittarius remain separate for some distance farther south but rejoin one another near the Southern Cross

Considering the Milky Way as a whole, then two facts stand out prominently. It is very much brighter on one si le of the oclostial sphere than in the opposite region and it is split into two for about one-third of its whole extent this division occurring on the side of heavens where it is brightest

When seen from southern latitudes— for which alone the finest regions of the Milky Way from Argo to Sagittarius are the northern parts of the Galaxy is so plain that it seems remarkable that so little attention has been paid to this feature attention has been paid to this leature until within recent years. One cannot help saking questions about it. Why should the Milky Way be so uneven and why should it be split lengthwise the way it is?

The answer t the first question is really almost vious. The Milky Way looks much brighter in the nowhere near the cutter of the universe of stars Indeed, nowhere hear the collector of universed stars induced, it looks for m present evidence as though we were well out toward the side. Consequently when we look toward the cetter we are a great many more stars than when we look away from it and the Milky Way appears

correspondingly brighter
This fundamental is t was first fully brought out by Shapley s rem rkath investigations on the glob general direction of Sagittus is and that its distance is general direction of Nagitta is and that lie distance is probably something its a lundred thousand light years. The reason why this we not realized long ago is that studies of the brighter stars—those vanish to the naked eye, or visible in telescopes of moderate power—as about as many of these in one part of the Milky Way as a mancher. It was therefore supposed that we ware near the center of the Universe. When the actual fact was that our applorant in had not taken us out to the

edges at all be distance at which individual starp—

one the brughtest—will look bright enough to us to be

mille to the nacked eys is not, two or three thousand

light years at most, and very faw indeed of the stars,

which are visible in a small takescope can be as much as

twenty thousand light-years away. But the distance to

the limit of the 'Universe (takes, is, of the region where

the stars are abundantly needled through space) as

greater than this, even on the side away from the center

All our soundings appeared to be equal, because they all

should have recorded 'N bo tottom so long as they were

made in the Milky Way. In other parts of the sky,

where we can look obliquely across the relatively thin

layer of stars of which our universe consusts, we do strike

bottom and we find fewer telecopy stars, and aver fewer layer of stars of which our universe consuta, we do serve bottom and we find fewer telescopy is stars, and even fewer vanish to the naked eye, because we see clear through the star-sown portion of space into the vast void beyond But to do this in the Milky Way when we are looking

along the great layer of stars, and not across it we must study the very faint stars, which are individually in-significant, but so enormously numerous that their embined light forms the great star-douds which are so conspiruous to the eye When we do this, it is obvious at once that we come near reaching bottom, if indeed we

At 10 o clock Aug 7 At 914 o clock Aug 14 At 9 0 clock Aug 14 At 12 o clock July 7 At 11 14 o clock July 14 At 11 o clock July 22 At 1014 o clock July 30.

NIGHT SKY JULY AND AUGUST

do not actually strike it, in the thinner parts of the do not actually strike it, in the unifore parts of the Milky Way, in the northern sky—though to do so we must probably extend our investigations to a distance of thirty thousand light years or more But in the opposite quarter, in the brilliant southern regions, no one knows whether we have struck bettern yet, although Shaping settimates the distances of some star-clusters as 200,000

light-years to look as though in some places—notably the dark lane between the topo branches of the Milky Way——re struck a false bestim But an explanation of this must be deterred until next most.

As our map shows, the star-clouds in Sagittarius are now well rimble, due south, and at their present altitude along the stream of the Milky Way, but in reality far means to us, appear the sfars of the constellations flooring and Sagittarian is the south, Ophicase and Aquille higher up, Lymaind Opmus nearly overhead, and Applies higher up, Lymaind Opmus nearly overhead, and Caphus and Cassiogais it life north. The seaters sky is dull, except for the great square of Pepsaus. Capitarium and Aquille Augustain, the Southeast, are honomapienous. The western sky is better, with Yirgo setting, Bottes

above, then Corona and Heronies. Dras Major, in the northwest, with Draco and Ursa Minor in the north, complete our list

Mercury is an evening star and is well visible in the middle of the month. He is farthest from the mm on the 18th but, as he is moving southward can be best seen a little before the date, when he sets about 9 50 P M, summer time.

The most time.

Years for an avening star, and reaches her greatest clongation on the 5th, when she is a little more than 3t degrees from the sun. She remains in agit until after 10 30 P. M. and is extremely complication.

Man is a morning star in Genemit, rising luttle more than an hout before the sun. Suppler is in conjunction with any in the sun of the sun and the sun of the sun and the sun of the sun on the sun of the sun of the sun on onjunction with Yeaus on the afternoon of the 3th. He is in conjunction with Yeaus on the afternoon of the 3th, the two planets being 10 muntes of are apart, so that they can hardly be separated at a glane. Later in the month the ringed planet will be below Yeaus, but above Mercury, and might be mistaken for the latest by a hasty or tumine of a quartum, and comes to the meridian about 4 A. M. Neptune is in Cancer, and is too near the sun to be observed.

The moon is in her first quarter at 11

The moon is in her first quarter at 11 P M on the 4th, full at 2 A M on the 13th, in her last quarter at 7 A M on the 20th, and new at mudnight on the 26th She is nearest the earth on the 23d, and one is nearest the earth on the 23d, and farthest away on the 7th. During the month she is in conjunction with Yenus and Saturn on the 1st—a pretty eight—with Uranus on the 16th, Mars on the 25th, with Uranus on the 16th, Marc on the 16th, Jupiter on the 26th, Neptune on the 27th, and with Mercury and Saturn on the 28th. No news yet has come regarding the eclipse of last month, and it may be some time before the results are fully known Princeton University Observatory

Long 19 1010

June 12, 1919

#### The Current Supplement

THE study of earthquakes, their move A ments and causes has made considerable advance along lines of precuse mathematical physics in recent years. This advance has been made possible by the interest eminent mathematical physicists of all countries have taken in the difficult problems seumology has developed. A remaining the second of the contribution of the con in the SCIENTIFIC AMERICAN SUPPLEMENT

by the emberst Italian student Somiglians, in the Schusteric American Survivance, in the Schusteric American Survivance, in the Schusteric American Survivance, and the Schusteric American Survivance and the Schusteric American Survivance and the Schusteric Schuste

## Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

#### An Indoor Jack for Heavy Work

An indeer Jack for Heavy Work

TOR quick stoom in shifting cars or

trucks about in the garage, showroom, service station, tire shop, etc

there is need of a strong compact easily

operated, quick-seding, sack that will

both lift and transport. The short construction of the jack illustrated is a big

advantage in these connections the

length over all is but 40 inches, which

easables the implement to be manipulated

to room official to organized market.

to good effect in cramped quarters

Another distinctive feature is that the wheels of the jack pivot and are guided and controlled by the handle By being able to cut the wheels to right and left, able to out one whosis to right and left, it is possible to gain a degree of quick handling and accommodation in crowded spaces which even the short construction of the jack slone would be powerless to give This applies either to the manipula-tion of the jack alone, or of the jack when

supporting a car
The leverage is sufficient to lift 5 000 pounds with ease. The ratchet has a range enabling any car to be lifted high range enabling any car to be fitted night enough for any purpose with at most two strokes of the handle. The quick release latch provides for a rapid return to minimum height

The tack is so designed that the weight in he had a cannot throw the handle violently against the car Although the handle is fees and can be held in any desired position when the load is not being lifted or lowered, a light tension balance draws it, when under a load into a perpendicular position which prevents it from protruding parallel to the floor

#### Sterilization by Pressure

I N a recent bulletin of the West Virginia University Agricultural Experiment Station, Prof B H Hite and associates Professors N J Giddings and Charles E Professors N J Gliddings and Charles E Weakley, Jr., present the results of a very large amount of work on the Lefect of Pressure on Microorganisms together with the technique of high pressure experimenting in bacteriology. Sum marked bright the results are as follows No living thing has been found that

No living thing has been found that could not be destroyed by pressure Most bacteria, including those respons-ble for typhoid, tuberculosis and diph-theria, are killed in three minutes by a the for typitois, tubercutous and appearance of 78,000 and the present of 18,000 and the present of 18,000 and the time and present of 18,000 and the time and present of 18,000 and the time required to kill an organism at a number of widely different presents, the intermediate time-present establishment, the time required to kill an organism at a number of widely different presents, the considerable accuracy Sports required much there seems to much longer time under the present sport forming organisms in the vegetative stage are safely hilled, and resellated no may be accomplished by repeated brief applications of 78,000 pounds jest against lack.

The above applies to reconstanting and the present of 8,000 pounds jest against lack.

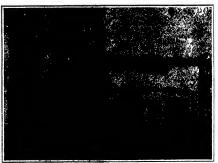
case of 74,600; pressure.

The above spaging to twom interpersure. Working at somewhat higher experiences in world be expected that over pressures would be affective, and his for the little securities of the control ne for I degions or reactionity the same.





The new jack in action, showing the short stroke of the handle, and a diagram showing the range of movement of its piveling axio



The machine for aquesting bacteria to death, set up in a testing apparatus to demonstrate that it will exper, a pressure of 150 tons per square inch (not the limit of its capacity)



The metercrite de an indeer tractor

pour is at the close of the day work and to find everything at rile and ready for work the next morning

work th next marning
Wor ing at 46 degrees C a pressure
of 75 000 t 100 0)) pounds per square
inch must be released or any water in
the only ressed material will be converted into a mass of soft ice. On releasing a priss of 200 000 nounds at leasing a press of 200 to pointon as or frozen hard Most other liquids attract or freezing so frozen at higher temperatures when pressure is applied (omparatively low pressure is apply d comparatively low pressures were found to be sufficient to freeze many liquids and the use of high pressure in obtaining low temperatures is suggested bolid chloroform melting at 70 degrees C was easily prepared

The high pressure equipment used by Professor lite and his associates is very simple and easy to construct. A high pressure cylinder may consist of a block of steel with a hole through it the hole leng closed at either end by steel plugs leng closed at either end by steet plugs on of win h is img en night to serve as a past in The linuid to be compressed as completely encased in a lead (or other soft metal) par ing which consists of a p see of lead tubing both ends of which are closed with lead lids. The pressure a samelled to the nacking and its conteptis is applied to the packing and its contents sa applied to the packing and its contents. There are no leaks the pressures ob-tamable are limited only by the strength of the cylinder and piston (yinders litended for very light pressures were built up of several concentric cylinders arunk together and thoroughly stretched by applying higher pressures than were to be requiarly used.

the picture shows one of the high pressure eviluders set up in an Olsen testing macline The inside diameter of this c linder is 0 632 inch A 16on this c inner is 0002 incn A 10-med sun built on the same proportions would be more than 1 i feet across the breech Incidentally the puton is sup-porting a load of 52 tons. The puton is supported by a column of water The cylinder had been used many times at higher progress. But his test was at higher pressures But this test was made and the picture taken by some doubting engineers who were satisfied with 300 000 pounds per square inch

#### The Motorcycle in the Factory

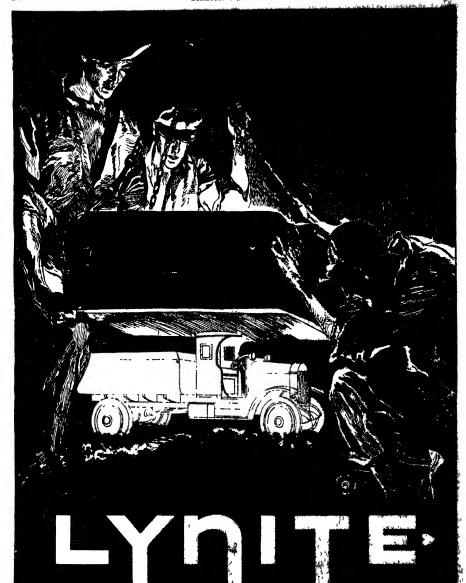
THL motorcycle is here seen in a flawarian pineapple cannery, used as a heavy hauling unit or baby tractor. The gearing is in the ratio of 26 to 1 in low gear 16 to 1 in intermediate gear and 10½ to 1 in high gear.

The hauling capacity is four and half tous to a trainlead of four cars each It tous to a training of four cars each It is figured that the pines are moved from the cooling floor to the warehouse a distance of one-fifth of a mile at the rate of two and one-half cents a ton machines are in use at the cannery, hauling from ten to eighteen cases of pineapples a day

#### Latest Patent Decisions

THE two patents here involved concern the construction of a tin cap, at the top of a yearly calendar pad, which by engagement with all in a permanent

engagement with alt in a permanent bactboard holds such pad in engagement with the bactboard. The court below found the patents valid and infringed. The ease turns on validity, and the court adds nothing to the reported case by a further discussion of detail. The question of inventive character of plaintaff s tin cap was one of fact A per-manent, slotted back, on which a new (Communed on page 701)



# Remolding the Motor Truck

Part by part piece by piece, Lynite foundries are remolding motor truck and motor car to new standards of liveliness and ease of handling, of gasoline and tire-saving.

Part by part, piece by piece, pounds or ounces are being cut from costly excess weight-pounds from the bigger parts such as cylinder blocks ounces from the smaller ones such as hub-caps and pedal plates.

For the automobile industry has found that no casting on a motor truck or motor car is too big to be made of Lynite, no piece too small to be worth making lighter through its use

Yesterday automobile dealers looked dublously upon efforts to make of Lynite a few such parts as crank-cases

Today more than seventy different car and truck parts are made of it one car alone containing 48 different pieces

And to the automobile world today Lynite no longer means those parts pre senting comparatively simple metal lurgical and foundry problems

It means the whole external structure of the engine-from cylinder head to oil pan It means the heart of the engine -the pistons It means entire bodies It means in a word practically every part for which heavy cast iron was once the accepted metal and still others that were formerly of steel brass wood or other material.

Lynite today is reducing the weight of motor cars from 300 to 500 pounds-not alone by getting rid of scores at one sweep from the larger parts but by trimming off an ounce or two here

an ounce there from a multitude of smaller ones

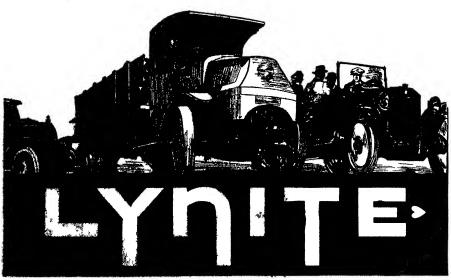
What is the explanation of this prog ress? For this you must look not alone to the tremendous strides which Lynite Laboratories and Lynute Foundries have been making-and are still making in extending the use of Lynste to more and more applications in the truck or car You must look as well to the readiness of motor truck and motor car builders to meet the ever increasing public demand for weight economy and all that it means

Together they presage the coming of that day in the not distant future when the truck or car with a cast iron part will be as out of date as is the one of today without electric lights

THE ALUMINUM CASTINGS CO

Lyndre and Lynux Castings
Plants n
Cleveland Detroit Buffalo Farfield Conn

#### Lyngte is Used for These 79 Different Truck and Car Parts



## Recently Patented Inventions

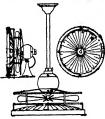
Brief Descriptions of Recently Patented Mechanical and Electrical Desices, Teets, Form Implements. Ele.

Bisotrical Sevisors

HATTERY ADAPTER — M. H. Surry, 1647

Angers Forrece Philadelphia, Ps. The object if the sum agrees with the entry loss of the sum agrees with the entry loss. The object if the sum agrees with the entry loss of the superaises and arranged to accommodate at least two battery cells each subject to be removed when based out to permit of substituting a new one. Another oblect is to provide a successful to the sum of the

DEFLECTOR FOR ELECTRIC FAN—
R C Write 901 Florida Life Ridg Jacksonville
Fig. The invention has for its object to provide
a deflector which may be used in connection with



TYPE OF PAN

breeze created by the fan may be broken up and distributed. The device is so constructed that it may be attached to fans already in use, it may be used in bed rooms or hospitals without harmful results in offices without disturbing papers set. s, or as ceiling fans for large areas

#### Of Interest to Fermers

ORADER DRAG PLANE—H II TRUBETON
Anoka Minn The invention has fir its object
to provide a device of the character specified to provide a device of the character specified by means of which a road may be cut or sraped to the proper inclination and the superfluous soil moved to the side whorein the inclination of the blades is varied by shifting the frame and wherein all wheels gears and levers are elim

ROTARY DRILLING OR SOWING MA CHINK—COEP Julies 1 Avenue de 100 decretacide larie France. The invention neases to a nachine for all kinds of seed or manure in continuous or discontinuous kinds of the decretacide y a ferular rim in the form of a disk accetefacid by a ferular rim in the form of a disk acterized by a firetiar rim in the form of a disk provided with juns the said wheel rotating about an axle which supports by means of a france a seed or manure hopper communicating with a detachable tube which convrys the seed either to the front or back of the rim

#### Of General Interest

BOOK POSTING DEVICE—E VARLEY care of Standard Bank of So Africa 10 Clements Lake Lombard St London England The Listic Lombard on Lombors angushi are invention has for its object to provide a book posting device having two reliefs spaced apart a tough absorbent paper being relied on one relief



VIEW MADETRATIN FOW MY M IN USED AND PAC-STREET OF AN ENTRY AS BEEN THROUGH BEVIERS SIDE F PAPER

and laving an end a unrel to the other so that they are many be roll if thereon the paper being they are many be roll if thereon the paper being the roll of the r



OF THE BED

or ugers and yet strong material and including a tent cover as an accessory so that the bed mu-be used more particularly for camping and that can be readily carried about in a conveyance as for example an a stomobile where it will take but little room of light and yet strong materi

little room

BINDER F H Catuar 226 E 4th 25

Los Angeles Cai This invention relaces mere
particularly to transfer binders in which loose
feaves a c permanently stored Among the
objects is to provide a binder which will avoid the
ne essity of an adjustable clamping member
or an unsignity birrefeding how with a suit or so wan imaging threshol post with a not or wound a fexible post to secure the proper adjust-sent to provide a binder with no protruding combors which will mer the furniture

#### Hardware and Tools

TOOL - W H WILSON Tules Okis. This invention has for its object the production of a device consisting of sections movable toward and from each other especially adapted for consecting a crubbing brush mop sand blook or the like to a handle in such manner that the strendle may be interchanged and may be used with the sax

handle

FOOL —W F GARWON BOX 73 Parkman

Wyo The invention has for its object to provide

a tool especially designed for use in building wire

forces. The tool comprises a pair of handle

interpretation of the comprises a pair of handle

interpretation bryonic tool and tool to the comprises a

pair of cooperating faws as took did who town

not jawn having rounded recomes for resolving

the wire to permit the wire to turn and sligh the

handle member not having the claw being pro
vided with notices or comparing the wire.

Machines and Mechanical Devices

Ave Brooklys N Y The Inventor relates
particularly to hall bearings of the clear which
cages are employed for holding and expansing
the balls. The principal object of the inventor
is to provide a construction of a case which can
be used for a single double or multiple ball
bearing

LIFTING TRAP -- G R CARTER, Oklahon LIFTINO TRAP—O B. Carren, Oklahoma Onka The investion relates to liquid distribution mechanism An object is to provide a litting trap for transferring wester oil or observed that the control of the con the master valve shifting float

CLOTH RENAPPING AND REPINISHING CLOTH RENAPPING AND REPTINSHING MACHINE—B. J Drantans Sociocost Ave Hackessneck N J The search object of the invention is to provide a citon napping machine for merors ing garments the device conductate attraction condition for easilying the subject, catter and presser to operate effectively, the table embedying a board and occening spinsiclesed javes for bodding the articles of a machine condition the supplied implements are despited for the condition of the supplied implements are despited for the condition of the supplied for these with a maker through a featble staff.

AUTOMATIC TWYER CLEANER FOR

apparatus is once in operation by the attendant. The device is so designed as to constitute an attachment for converses of standard design silicout chapping the constitution thereof and without interfering with the surning of the

AUTOMATIC MAGAZINE PHONOGRAPH —E America Gilles Depot Octobrio Canada Among the objects of the invention is to provide a self-contained cabinet or casing of compact form a self-contained cachine or desing of complete perm and convenient site, adapted to carry in operative position a considerable number of selected records with mease for bringing any or all of the records into playing position the device being fitted with automatic evictors and etops or arranged that the machine will play any selected group of records one after another and stop as the said of the last of the self-contained and the self-contained to the self-contained and stop at the said of the last to the self-contained and stop at the said of the last of the self-contained and self-contained and the self-contained and self-contained and the self-contained and the self-contained the self-contained and 
PROPRIES AND -8 X SPOUT 250 Golden St. San Prancisco Cal. This invention has particular reference to a card on which sounds may be received and answers reproduced An object is to produce a card having a portion thereof provided with a record receiving surface, and after having a record prove for each provided to the surface may be salely forwarded by post Another object to be providen means in conscious with the piec and and recorder for guiding the styles of this latter.

#### Prime Measure and Their Ac-

Prime Mevers and Their Assessmentes CRANK CARS OIL TMAP—d. R Pocurators. 185 Gardad Are. Mitwantee We This investion relates to internal combustion engines and has for an object the provision of a construction for the create closing whereby the librication oil therein in constitually respect practices of the position of the aughts. A fifther object in the create costen a ray at a normal production and to maintain the oil until the engine zero production and to maintain the oil until the engine zero.

position.

ROTARY ENGINE —8 E ROCEMBLARM &

N Main St Washington Ps An object of this
invention is to provide a rotary engine having so
deed center thus permitting the engine to start
up and run no matter where the oscillatory pisup and run no matter where the oscillatory pie-tons happen to be with respect to the steam chamber A further object is to provide spring presend oscillatory pistons which are normally held in operative position and to provide means for modering into devion steam tight has is no say for preventing the passage of steam between the object of the oscillatory piston and the walls of the

#### Railways and Their Acco

RAILWAY CROSSING —L BYAN 4240 Mac pherson Ave St Louis Mo. The invention has for its prime object the purpose of reducing to a for its prime object the purpose of reducing to a minimum the pounding and jar incidents to cross-ings of street rullways. The levention provides an elevation as the distant die of the flange grue we and a bevel or inciden leading to the eleva-tion the arrangement being such that belows the trend of a crossing wheel leaves the rull as no side of a grove the tread of the wheel at a forward point thereon will constant with to include leading to the elevation content with to

#### Pertaining to Res

Pertualsing it is Recreasibles

GAME—N E KRALL JOSH WY Vernon Ave.
Sam Borandino Cal. The invention relates to a
same board and pieces of which has playing find a
longitudinal and transverse transverse play
having openings adjacent the points of insersection for the reception of the pieces. The game
may be played by two three of two players, and
in case of four players also years yellow to
conditional and transverse players are players and
in case of four players also years yellow to
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AMUERMENT APPARATUS—R 8
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Invention has feet in object to provide its apparatus
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to efficiently continuels of different managing
readily consequently along the same from.

AXI.R HOURING CONSTRUCTION—D.

O Gorr 2312 Weathington Ave. Exercised.
Tehm The object of the harvesteen is to provide a looming two looks of the harvesteen is to provide a looming for a look and and are five and is one until the statishing light weight companions and or a hollow protein the the look and provide a look of the whole harvesteen for the look and the epitality inviting content and the spingles are mouved within scales and the spingles are mouved within scales in the look and the spingles are mouved within scales in the look and the spingles are mouved within the content in keep closest for recording the provides of the whole and the spingles are mouved within the content in the content in keep closest content in the content of the co

signal whereby they may be visible as alght.

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ISM—OF P. MA. NOTON. 1830 Tilden Ave. Brookbry, N. Y. This invasition relieses to assective
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the controlling mechanism to devices without recepting

EMERGENCY BRAKE—F J Bosset, 21 Germania St Galeton Fa The invention re-laces to a brake device especially adapted for Ford ours its general object in to provide a sub-stitute brake construction whereby the brake



A SINE VIEW OF THE DEVICE

band will engage externally the brake drum so as to secure greater reliability and holding power supporting means being apptied to the stationary disk associated with the brake drum for holding the brake band and the togale device for contact-

DESIGN FOR A SUPPORTING PLATE FOR A HORE- SUPPORTINE —C J HAUREN SOR W SORE SO, New York, N Y

356 W 5058 Ns., New York, N Y
DESSON FOR A FLAGH—F A WAYESHOURS, 856 Humphrey St. New Haven Com.,
This crassessist design shows a combination
flag. The Stage of United Sistem. England,
flag. The Stage of United Sistem. England,
flag. The complete the stage of county-served other seasons of county-served other seasons representing the
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We wish to quilt attention to the mar in a position to render consistent over branch of pattent or reader consistent over branch of pattent or reader in the staff is composed of mechanical, when the staff is contracted on the contracted of the contracted of the contracted near the staff is contracted or of the contracted or of the production, the contracted or of the specialists, the contracted of the specialists, the contracted of the specialists of the specialist



Copyr gh 1919 by The Goodyear Tire & Hutber C

POR rural motor expressing and general country hauling, we are convinced it is more economical and profitable to use Goodyear Pneumatic Cord Truck Tires—instead of solid tires. On solids, we have lost time, paid out losses in breakages and had to refuse business. Our Goodyear Cords paid for themselves in three months in business increases alone The rest has been sheer veloet "— Mr Jack Ginocchio, part owner of the Gardnerville Freight Line, Reno, Nevada

THIS rural motor express saves one day out of every three by using Goodyear Pneumatic Cord Truck Tires

A truck on these tires now completes a regular 104-mile mountain run daily, whereas a solid-tired truck covers it only twice in three days

The Goodyear Cords also cushion loads of farm products formerly damaged by the jarring on solid tires, and they reduce operating expense

A galion of gasoline lasts 11 miles on the pneumatics and 6½ miles on the solids

A quart of  $\alpha_1$  is consumed in 21 miles on the pneumatics and in  $17^{\tau_3}$  miles on the solids

On top of these savings the powerful Goodyear Cords are promising to rival or even surpriss the mileage delivered by solid tires in the same service

The experien e related, however, offers only one instance out of many in which the pioneer Goodwar Pneumatic Cor i Truck Tires have demonstrated their all around advantages for exacting hauling duty

THE GOODYEAR TIRE & RUBBER COMPANY AKRON OHIC



# Introducing Williams' "Agrippa" Turning-Tool Holders Set Screw Pattern

To provide increased and abundant variety of selec-tion in Wilhams "Agrippa" line of Tool Holders, we offer this Set Screw pattern of Turning Tools pri-marily for those who use Cutters made of steel which marily for those who use Cutters made of steet which has been hammered or rolled with a greater variation in size than is common to usual mill practice. But for the majority of users who purchase Cutters of accurate size, we recommend the original "Agrippa" Turining Tool of Cam Pattern as being stronger, more reliable and more selectedly satisfactory than any other method

and more generally and offset and Straight Styles in Right and Left Hand Offset and Straight Styles in stock at same price as Cum Pattern of corresponding size Write for a copy of our Machinists Tools Booklet.

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iffy production high class ma tool has made

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General Offices 28 Richards Street ooklyn New York

## Friction Disk Drill

CONTACTINES Corles Engues, Breve and Bottlers Maches FOR LIGHT WORK Has Those Grant Advantages good on he I stantly chateged from 0 to 1600 at stopping or shift! I brits Power applied can be able to derive with equal outer he specified to derive with equal to the specified to

W. F. & Jno. Barnes Company

BEND LATHES



#### Thirty Million Years Ago (Continued from page 656)

The Burgess fauna of Walcott shows that The Durgous fanns of Walcott shows that he pre-Cambrian investories invested all water areas and because completely adapted to all life sonce of the sas, except possibly the abyese. The varied orders of the sass we know today were there. The orders that last the seas for lead are were there. But the main question are were there. But the main question of these great invertebrate divisions was it that says near to vertebrate it that says near to vertebrates. it that gave rue to vertebrates?

of these great invertebrate divisions was it that gave nate to vertebrates? Palsousle Epoch next above the Cambrane, is the period of the first vertebrates known Walott found near Canon City, Colo., that is set in the first the set of the period of the prevent Bighorn Mountains of the derivent Bighorn Mountains of the period of the prevent Bighorn Mountains of the period of the prevent Bighorn Mountains of South Dak. ta, small spines referred to sharks also shundant at Canon City. Sance they were slow moving types protected with the beginnings of a doreal armiture composed of small caleargues tubercia to which the group name Offers where the state of the period of t armored Ordovician cetracoderms, very httle is known. It is in the later Upper shows is known it is in the later Upper Silurian that we obtain our first glimpses of North American land life in the scorpion spiders the oldest known air-breathing animals and also of the first known land

Thus Walcott must be credited with having set up the whole panorama of first life on earth with actual fossil specimens of the creatures from which later insects, the pro-fish then true fish, then reptiles, then livis and then mammals and man

arose Oshorn's investigation of the first ap-

construction of the first appearance of plant life on earth carries back consuct rably before the above sentioned animal forms awe light. He states these of the periodic properties of the very animal limbestomes back of the very animal limbestomes the collection of the very animal limbestomes that the collections bacteria, developed the innever limestones of the Belt mountains of Ministan we are now beginning to see where the magness of the Belt mountains of Ministan we are now beginning to see where the magness of the hierarchy the most where the magness of the hierarchy the most limpertant contribution of that constituent for merchant marine.

The Grenville series of rocks at the base of the Palaconous secontially calcareous with a thickness of ever 94,000 feet nearly eighteen miles, more than half of which is calcareous, according to Pirmor and Schuchert Thus it appears probable and stationer raus it appears probable that the primordial surface continental waters swarmed with these minute sigae, which served as food for the floating. Protoson one-celled animal forms."

## British Textile Industries as Affected by the War (Continued from page 684)

possible if unrestricted sympathics by agents of all the Alliest governments had

den permitted been permutted. Whatever goods were purchased for the states gathers although the process and on the same conditions as for five error at the Brush government, and although "Arthurs," the Brush government, and although "Arthurs," arthurs, and the prices are the Brush government, and although "Arthurs," "Art stretch the freedom of the British manufacturer it has had important results in gitting the best out of the industrial organization of the consistery The tead-ency to concentrate in one hand the larging for the Allies from 'British Industries' sides from the stagle industries' has become more pronounced from year to year, owing to the ever increasing extingency of all sensitial ray materials, in contraction, with the presence on machinery and 'Babus,' has had an important ramp's. It was

the several British discrete and Allied tectors for critical goods we cause of a disproprishence discrete machinery and tracted. Where it requirements came too sloin as in run output, the retarded product and it impossible to province at its impossible to province at a second control of the muin output, this retarded professions and made it impossible to poisest all that their recaired Complete seasons all that their recaired Complete seasons their content in the seasons in the content impossible or realization, but long steps have been tables to limit the variety demanded. In purtuance of the content setting the content in the season of the content setting the content in the profession of the content setting the content in the woolen industry, where the changes in the woolen industry, where the changes in the woolen industry, where the changes application to the orders of Allied geverances of the British requisition system of purchase, and the issuance, against timb orders, of materials from the common stock,

purcease, and use measures, against some activity.

The system of purit purchase has also been extended to certain raw materials obtained from abreed Supplies of just and just goods for the Alless have for some times are been bought under the arrangement of the control of the

the Allies
Generality speaking, the system of Sentpurchase has effected considerable assocounts of knopey, labor and manadeid. It
has revealed unsuspected expanity on the
next of Betthis inclusteries. Purchase most
important, at has reduced. Allied dispendence upon mental equativities, and provided
goods for all the Allies on the name advariances.

the was occupying night become available for merchant marine.

The four 30,000-ton dreadmonghitz of the "Tourville cleas, prospected before the outbreak of hoselities, which were to have been laid down in the spring of 1015, were never begans ar view of the difficulture summer control of the difficulture and the control of the "Gustawa National" which were added to the Pressch narry. With the ecospition of the "Gustawa Zeele" (which was consulated and in the Tourself of the Tourself of the Control of the Con

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Internation Harvester Co. H W Johns-Manville Co Studebaker

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Corporation Tunken Detroit Axie Co

Ward Bakery Co

Illmou Glass Co

National Bueset Co

Wm Wagley Jr

Hert Schaffner & Marx

De Laval Separator Co.

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Bems Bros, Bag Co

If TOO HAVE AN INVENTION a which you wish to passes you can write fully age to the beauty you can write fully age to the beauty of abstaint protection. Fasses send electrical protection. Please send electrical protection of the development of the send protection of the region and a description of the development of the send of t

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Classified Advertisements

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10 K



under construction at the Schneider ship-yard fer the Japanese and Greek navies. These subnarioes were communemed in the course of the years 1918 and 1917 and were jerse the names Armide Amazon; and "Antigone The French navy lik-wes purchased three small submarines (340 tons) building at the same shippard for the Reumanna and Turking govern or the Reumanna and Turking govern complete them during the continuance of hostilities. Two largy mune-laying sub-marines ordered from the Schneider and Normand shippards likewise remained in

Normand shippards likewise remained in completed at the date of the signing of the

armistice
No compilation has yet been possible of
the repair work carried on at the vari us
shipyards during the war or of the signan ic
fest accomplished in converting and armin is
the merchant and fishing feets, but the
above achievement of the government and
above achievement of the government and
above achievement of the government and private yards, sugmeering shops and arsenals is evidence that every possible effort was made to answer the demands made upon them by the sudden transformation of the sea force from a peace to a

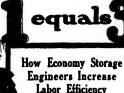
## Lake Michigan's Encreachment on

(Continued from page 687)

extremely rapid in comparison with the rate at which seas usually destroy their coasts. This high rate of destruction is coasts. This high rate of destruction is accounted for by the kind of material washed away and its low power of resistance when attacked by waves Compare the work of the lakes #aves north of Chicago with that of the Atlantic Ocean at Gloucester Mass or of the Pantic Ocean at Cypress Pediat Coll. The Lite has material mills show The lake has penetrated miles into the land while the oceans have progressed only rods in the same time but the sea have worn away cliffs of hard solid rock have worn away cliffs of hard solid reck a foot a century perhaps while the lake, has encountered only loose soil. One sight watch the Atlantace aware posnicing for months et. Gloucester and never use a front of the sight was a foot of the sight with the sight of t

in the district under consideration. The soil consists of clay sand gravel and brulders all deposited by ice during the Clacial Age Most of it was brought down from the north on moving ice floating on from the north on moving ice floating on water or pushed forward over the lan! Part of it undoubtedly same from Chanda several hundred miles distant from its place of deposit but other was stooped up as the moving ice crossed Wiscoman as may be learned from an esamination of the material. The les sheet was kundreds or perhaps thousands of feet thick and was ladden with earth and stones. or perhaps thousands of feet thick and was laden with earth and stones it progressed little farther southward than the southorn and of lake Michigan There, it mitsed during many conturies and its load of earthy material was dropped forming a layer from 100 to 200 feet their. That transportou material is now the land and the soil of the region and it con-tinuously the soil of the soil of the con-tinuously than the soil of the region and it con-tinuously the soil of the region and it con-tinuously thanks and the soil of the region and it constriutes the banks and bluffs which the waves are now b sting down and washing away Steadily during thousands of years

wave are not over acquired to the same area. Stoodly during shousands of years the wave hard been accounted to the same acquired to the same active during so long a period as continuing with such rapidity under the very eye of the observer that he may conceime so the same active during so long a period as continuing with such rapidity under the very eye of the observer that he may conceimes so the observer that he may conceime so the source of the observer that he may conceime so the between the at-from the three same acquired to the same acquired t



Sheer muscle power is not enough. In the average warehouse more than mere number of men is needed. For though guant of stature, they cannot reach the high points And so space is wasted

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material and planing is within reach of the waves which specifity earry it sway Wingwale and breakwester have been the property of the property of the to check this destruction. Some of them are built by private parties to protect their lands which front on the lake; others are the work of eiths, companies, associations, and municipalities for a similar purpose. The lake shere porth-used from Chicago heavy, or and and and invasionally and the property of the pro-tection of the property of the pro-try of the property of the pro-try of the property of the pro-try o Milwaukee is covered with magnificents private estates, club houses and grounds, golf courses, schools, manufacturing plants, hospitals orphanages, towns by the doses, government property, including Fort Shendan and the Naval Training Statuon at North Chicago

Sheridan and the Navai I running present at North Chicago

The continued advance of the lake into the land is destroying or imperiling much of thus valuable property. In consideration of that fact the lake a scirvities cannot be that fact the lake a scirvities cannot be a second little or not of that fact the lake a scravites cannot be viewed lightly it mattered little or not at all in the long ago when the only human inhabitants of the shore were the savage Indians who could easily move their camps farther back when the caving camps farther back when the caving banks threstened to precipitate them into the lake The millionaire who owns the land now cannot move back as the waves approach, and he builds breakwaters to protect his property Calculations which make what seem to he resonable allowance for uncertainties concerning the average dont of the land

be reasonable allowance for uncertainties concerning the average doubt of the land which has been washed away by the lake during the past four or five thousand years show a yearly average of 7,000,000 tons of soil that has gone into the lake and disappeared from the 150 miles of shore north of Chargo. The 600 square nuise of land would equal a cube 12,000 (est on the side of land would equal a cube 12,000 (est on the side of land would equal a cube 12,000 (est on the side of land would equal as the beauty of the side of land would equal as the side of land would equal a cube 12,000 (est on the side of land would equal as the side of land would expect the side of land would or and would equal a cuts I and how to come the side amounting to several cubor miles the annual toll of 7,000,000 tone is an anormous quantity to sink from eight boneath the water every year, and its final destination excites interest fix hundred square miles of land are not easily hidden square miles of land are not easily hidden Must of the burden a soft, extramely fine material that was ground to rock powder by glosers in their slow journey from the north long ago. But maced with this finely ground material are occasional streaks of gravel rocks and large boulders which were dropped when the set that carried them was noticed. These may be seen protecting from the less of this bluff grow to the set of the butter of the set of the seen protecting from the less of the bluff or the set of along the water front. As the hand wears away the boulders rell into the lake where they rest because the currents are not strong enough to move them A few large boulders lie strewn over the country where they were evidently dropped from leobarge floating over when the respon was covered by water One such boulder, weighing probably 100 000 pounds, lies must het was the street of the lake betten off shore and such are partecularly numerous of the town of Winnesta, where they mark the position and direction of a former glacial moraine which the lake had destroyed by its encreachment. The remaining sith of the moraise forms the lake builf at Winnesta, and the activesse end of the such as the lake builf at Winnesta, and the activesse of the lake in the lake had a control to the moraise forms the lake such as the coupled by the samelegal conditions of the such as the same of the lake in the lake along the water front As the hand wears away the boulders roll into the lake where

has carried the sand and dust valued, some of it many mine frox the present sheer. The sand hills, durse, and ridges which form so conspacous a part of the landseeps between Gary, Indiana, and Minhigan City, and beyond, are build of this material. Some of the hills are from 100 to 300 feet high, and mile in status. The finely-powdered mad is driven before the wind in auch quantities as to bury forces in eight.

#### Ameteurs in Name Only

while some apparetus of the inexpending category is now bring made, for the most part the manifestiment have gene on to what is gractically commercial equipment. Where an instrument used to core three dollars, it now costs ten where a complete recovering set used to cost \$20, in new costs \$100. But there us as much difference between these cots as between the cost as between a "ene how shy" and a powerful autoenchile.

#### Wherein Nothing but the Best Will De

Nothing serves better to illustrate the type of instruments and sets now being produced for and purchased by the ame-teur, than some of the accompanying illus-trations. The mechanical and electrical trations. The mechanical and electrical improvements that have been carried out are wrident at a glance to those familiar with pre-war equipment. No longer is wood acceptable for mounting the metal parts and familiar, and even hard rubber with standing disquees and indicators will not pass messer with the critical annature land the same of the materiments must be of beachts with the lettring and must be of beachts with the lettring and the standing of the metal parts are finished in black coydised brase and white nicked The knobs are large and carry and lett in the latter which in the latter which is the same of the same parts are finished in black coydised brase and white nicked The knobs are large and carry nnined in blace oxyclased brass and white nickel. The knobs are large and earry dials which turn past a marker, instead of the old practice of carrying an indicator on the knob and fastening the dial to the

panel
Simplicity in design and operating controi is the object of the designers of the new
amateur apparatus, sithough the circuits
employed and the methods are by no means

anateur apparetus, although the erroulis employed and the methods are by no means elementary, involving the very latest commercial practice. While manufacing the very best appearance the present apparatus receives the name care with expression of the interior details, as a review of the interior of the interior details, as a review of the interior of the interior of details, as a review of the interior, in constitution of the interior of t

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# DURAND inexponence products still being offered to beginners in the art bai why oull those ongaged in that STEEL RACKS introducting work amateurs? When the interesting work amateurs? When the limited States went to war the Army and Navy had no difficulty in obtaining all the work of the state of the sta



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18) BOWLE PRISERVER rrented, without reserve, to remove between event of the and eatle formation.

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wireless personnel necessary for maintain-ing sommunications Whereas European belitzerents were obliged to train young men in wireless telegraphy, the United States had more men for this class of service than sould be piaced Not only were they expert radio operators, but in many in-stances they were skilled radio engineers

### Amateurs in Name Only

The very men who are now designing anateur apparatus have designed appar-atus for the United States and foreign Gevernments The very men who are now returning to so-called amateur wireless have held important positions in our Army and Navy There is very little about radio and Navy There is very little about radio that they do not know, and even less that Build Now!

THAT factory is not the late of the sand there was the sand the work, and a farer name would be "made or reflect the sand ther work, and a farer name would be "made experimenter or "ever, that is left to the smateur themselves, the same that the service of the same entreed. carriing you dividends while hat is left to the anatour However, who have heresfore been so engressed it exists only on blue prints.

That school or gymnasium is needed for children who are growing are NOWY.

## (Continued from page 805)

That club, not yet built, might be giving pleasure and gaining members.

Buy now and build now.

Don't confifor prospective! Startit.

Write for Combinate of steal lockurs are start to be in the case on its beet to a movelob backboard, was also do A. metable op at the top of a supprocurate open to a movelob backboard, was also do A. metable op at the top of a supprocurate open to the company of the steal lockurs and the supprocurate of the superior of the su the nails went through the tin cap and bound the sheets together

After eareful consideration, the court is of the opinion these improvements were the natural advance modent to the art of the opinion takes improvements were the natural advance modern to the art lit is true the plantid's cap made a more attractive booking ealender now which had a finner connection with the backboard which the control of the state of the control of the plantid part of the control of the con

The decrees below are therefore reversed and the cases remanded, with instruct to dismiss the bills —Eddy v Kramer U.R.C.O.A. of Pa

U. R. C. Q. A. of Pa.

By this statutes of New York, a sealer of weights and measures is appointed in every country and every city by the feed substitution, with the duty, among other things, the keep safety the stands and to seal and mark men register as correspond, which the stands are for the properties and measures white, including other country and measures white in the present of the properties are for the properties and measures white in the present of the properties are for the properties and the properties are for the properties and the properties are for the properties and the properties are for residually to the properties are for residually and the properties are for residually as a present and



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| is dirigill to observations as a consequence of the                                                         | Flectro ulture ti ry of 539 Farming f r returned sold era 500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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| Hims rges rigid strehtps 183<br>Trans-Atlar tie dtrigtble ent 5 * 49<br>Zoppelin sheds Germany * * 343                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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                                                                                                                                                                                                     | CASTINGS of non ferrous alloys 57<br>CASTOR BEAN and its uses 836                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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| CONSTRUCTION Airplane Umber our 113                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Farm ial r to oure emples 34. Fertilising dynamite and 42.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Absence of Ireaks , 184 Accident, odd *307 Activity in invention 311 Buying stimulating 311                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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| Ford of the sir 113<br>Instability of our airpla es 118<br>Martynaide trans-Atlantic 489<br>I ropollers molded 11<br>Propellers waterproofing 249                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Grain binder troubles 60<br>Hay-loading rack movable 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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                                                                                                                                                                                                     | Automatic chemist the Chamical Foundation 21,6 Colloids at work 24,2 Labyrinth of chemistry 100,5 Non poisonous game 140,5 Proking up hot handful 10,5 Proking up hot hand   | EXPLOSIVES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| I ropellers molded *11 Propellers waterproofing 249                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Irrigati n scherne ngemous 945 Keeping larm roads fit 912                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Crankshalts finishing 148 Far Eastern demand *124 First aid to motorists *584                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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                                                                                                                                                                                                                                                      | Continuous nitration . 21 Specific . 22 Toluol and res industries 240                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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| To make airplanes safe 485 573                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Locust return of 17-year *310                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Anddents office and the second of the second | Constraint of Chambersy 1820. Non poleomous game 1440. Proking up hot handful 1820. Reconstruction phases of 33 Reporters chambers 1822. Reconstruction phases of 32 Reporters chambers 1822. Reconstruction phases of 32 Reconstruction phases of 32 Reconstruction of year 1918. 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| Trans Atlantic flight airplanes *202 Wings of metal *95                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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                                                                                                                                                                                                                                                      | FACTORY AND THE HOME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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| Wings of metal 905 Fatorism an parach to price Airy ian parach to price Airy ian parach to price Airy is no metal 113 Airy is no metal 105 Airy is no metal 115 Airy is no metal                                                          | Oak leaf polsoning of animals of<br>How ng and harrowi g at once *61                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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| Always on its ties 148 An rice first the Atla tl *664                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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| Chicago-New York flight 481<br>Cockpit of trans-Atlant sea-<br>planes ************************************                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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                                                                                                                                                                                                     | CIBOIA REVEAUED . *94                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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| pisuse **Mark Andes **Inghand to Indus by a piano describing in the Indus by a piano describing in the Indus and Ind                                                         | Sols rveys U S 11'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                                                                                                                                                                                                                                             | COCOANUT OIL handling 205 COM ARSES, testing of 165 COM PASS, THE WIRELESS 2991                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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| Crossing highest Andes Faging to India by a rplane Lessons of the trans-Atlant c 100 I ou in Cape Fown flig! Naval gla c for transatlanti Navy s bliff rt ans-Alant 411                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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t reed into tractors 11.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Arm r for the tro  ( antialising race suprence 311  Testing tires on is t rv roof 4401  Tire mileage sells are 393                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | COMPAN, THE WIREI ESS "291                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Color of takes studying 481 Marine alone of Pacific count 281 Salmon on coast of Maine, 273 Warding out poisonous falses 428 FLAX describeding inschipe. 138                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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| Navy s bliff t ans-A lant 47 Passenge carry ng record 19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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                                                                                                                                                                                                                                                      | FLOOD PREVENTION PLAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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| Pil tless flight ling 64<br>Raot to the North I ol 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Tractum fficial list f farm 23. The lewerd lemes a rp 63. Warsine agri ulture (t Britain 2). Weeds kill g witt steam 550. Wheat nuch 1 tile orn? 600.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Bull gear drive 1 × ng 148<br>Clin bing Mt W is n 448<br>Dynamometer new a tor *376                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Over-night concreting lob 978 Water how n uch? 266                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Miami. FLORIDA, swamp lands in Adj. FLORIDA, swamp lands in Adj. FLORIDA (Fig. 1998) F |
| Hafety and co forte npet on 649                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ALCOHOL an absurd for m 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Farm tracture offic al list 232 Tank Inve tion that won aar 448                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Water how n uoh? ,366 COOTIF eliminating the 377 CORN CRIB CONCRETF 307 CORRENPONDENCE 27 97 117                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | PLUCKESCENT FLUIDS MI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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| flight *427<br>Trans-Atlantic d rigible entry *549                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Mhoat nuch I tils o'n?  ALCOHOL—an absurd fig re AI COHOL forn white nose ALLOY NFW AI HABIT A I HONETIC  25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Tank an set ry Tanks turned into farm tractors 113                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CORRENPONDENCE 27 97 117<br>169 J01 225 253 288, 215, 337, 889<br>429 488 509 541 578 601 625                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| Trans-Atlantic flight 1 ft 312 690<br>Frans-Atlantic flight publice of 74                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ATHABIT A I MONETIC 2N ANIMAIS Dogs of war 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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                                                                                                                                                                                                     | CONCEPTY 6 C service data concrete Flestrolysis in concrete Concrete data Flestrolysis in concretate Cory-claff concerning to Cory-claff concerning Cory-cla   | Bread why it gets stale British national restaurants Drythe flood new pressus larg submittates Guinos Byrup from grapes Whole lay for gangararine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| Trans-Atlantic h az<br>Trans-Atlantic non stop *656                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Dogs of war *10  Mules allower bath fr *016 Platypus new glands f 77 Questi of identity *576                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Clearing roads of en w *262 Cooling-system condenser *262 Driver protection for *40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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| Navy bill (r t ann A lant er programme accept ne record 19 Beauty                                                          | Ralies and public health prol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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                                                                                                                                                                                                                                                                            | FOOD  Pread why it gets state  British national restaurants (55)  Drydan food new process (25)  Guinos (25)  FO Winde ish for mangarine (25)  FO Winde ish for mangarine (25)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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| Wester man and occasi uving 102 Emerat.  Aerial p.li = 407 Atrplane express 165 Atrplane faunch ng from air- ning 111 Afraiane research f value in other 74                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Hall iss and public health profits  Ringy / Mammal gainer  Ticks w I mease carriers *2.6' Vanphic bat *28' Water Mon tor 16 Water Mon tor 16 Water Mon tor 20 ARCHAE ( JUY Archae logist I Mesop tama *9.6' ARCHAE ( DATE ARCHAE A | The hard was needed where we was a second wa | DAMS Plood gates automatic Plood gates Plood   | PORTATA Ass THEM AND CONSIDER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| ship Airplane research (value in other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Water Mon tor 18 Whate Kiler *491 Will life reservations 22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Cood roads and gas bills 282<br>Hauling kosher 1 cats 404<br>Highway transportation 793                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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                                                                                                                                                                                                                                                      | FORSIL DEPOSITS, Nebracks 488<br>FORSIL MINE, CALIFORNIA 618                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| fields 74 Airpfance ( r sportsmen 69                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ARCHAE(f)U1 Archae logist i Mesop tama *500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Long listance transp rtation *510 Motor-driven con me ai vehicle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | DEAN BANK NEW 924 DISK good-sense shool 9234 DISKAP Code-sense shool 9234 DISKAP See assuring AND STORMS DISKAP See assuring AND STORMS DISKAP SEE SEE SEE SEE SEE SEE SEE SEE SEE SE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | FOSSILS of sestern Colorado 9288 FOUNTAIN, electric lamp 9108 FOUR DIMENSIONS worlds of 117                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| Aired in we airt lane *98 Air traffic regulat n 481                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ARCTIC Hen EXP SAT N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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| Altis de-effect n eye #1<br>British flying f t re of *250                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ARMY See NAT ONA DEFENSE WAR FARE B I WAS THE ROPLAN 4086                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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                                                                                                                                                                                                     | DUMPER, CAR, BIGGEST 9303<br>DYES AND DYRING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Coal grading by air , 146<br>Coal handling buge bridge for *188                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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| Civilian fly ng 481<br>(mmercial planes 249                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ART TREASURFS restoring 167 ASH ron oval by stretch 661 ASTRON( MY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | N sei whel conve s n 1052 I wer wag it (or a rect lan ps 9516 T affic heavy New York 404 Traifor osarly loaded 2422 Truck as farm tractor 262 I niversal joint 960 War trucks will not flood market.682                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Dye industry, our 660<br>Hemp braid dye 22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| Rangland Helgium service 311 Every man s airplane 92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ARTRONC MY  MA #  Four period c cometa 649  onwara                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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| Exposition Aerona tleal It<br>Flying experience w thout leaving                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| gro d<br>Free as air 484<br>Future of alreraft 62                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Amer an Astr on So sty 4 Singlt night skee Ingland 49 Brit at solo la 147 Bull, intest 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Street sweeper powe 404 Travelling restaura t *602 AVIATION See ABRONA PETCS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Round peep and square holes 92<br>EFFICIENCY See IMPURTEY AND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| Gern an aircraft for peac 6<br>Giant Farman na 11 249                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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| G vernment sales f planes 393<br>l andl g on a ro f 9139<br>Mail servi e Army and 112                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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                                                                                                                                                                                                     | BLECTRICTY<br>BLECTRIC LIGHT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Oli es, seal for watchips 452<br>Peat dag by electricity 425                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| New York Lap att n 270 *290<br>Passenger a r liner 481                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Lantern slides 587<br>Long tu les B reau of 224                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | BALLOONS See ANN NAUTON 610                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Carbon electrode making 452<br>Fleetric lighting 40 years are 529                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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| Popularizing aviation 424<br>Review of year 1918 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Mete r tee lo strata 537<br>Observ ng owld as 1 49                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | BALERIA MATHEMATOR OF PROPERTY OF THE PROPERTY | Are lamp globes 137 Carbon electrode making 493 Flectric lighting 40 years ago 530 Flood tighting problems 22 Lamp shock-preof tungsten 540 Mercury lamps 54 More light, efficiency of 39                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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| Safe pis e at l w price? *512<br>Sasplanes for Saking etc 332<br>Seast no tube for al n an *346                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| Wenther forecast for flare 69 Wind currents determination of 620 Wireless telephone 90.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| MILITARY Aba idened sviation fields 509 Average our giant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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                                                                                                                                                      | Bryant, Isaao Hill 134<br>Clay Francis W H 571<br>Coggia Juroma 557                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Cables, rabber substitutes for 241<br>Condustor, iron pipe as 549<br>Conduit Saking dorice 92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| Airman a story an *420 Airman a story an *173                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Venus 393<br>STARS<br>Andr meds variable in 49                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Crookes Bir William *396<br>Pickering, Edward C 137<br>Richard, Charles Bris kerl off 455                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| Brasil's aviation service 569 British a riores 349                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Beta Cygn pr bably triple 577 Cephaid varial ins 311 Classify ng sta s 600 Globular olustors 311 Hollum star 1.77 Interstellar media 167 Mira f.et variations of 49 Novae Andromeda nebula 197                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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                                                                                                       | Occurred by Martian atmosphere 311 Planetary nebulae, size of 197                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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Estapol explorations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| tures with plans 165                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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| tures 153 Marti miling plans 153 Navy sir lance in war our 158 Operati 1 m ly ng 313 Our scheev e in aviation 68 Our sir serv f r peace 393 Peace treaty in German avia-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Southers access stars  For a comment of the comment | BOXES, wooden metal strapping on 644<br>BOX WOOD, substitutes for 1223                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Transference for imal pursing 1900 Transferences, artifuguishers for 197 years tobe, new form 1879 Variable resistance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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                                                                                                                                                                                                     | Variable resistance, new . 240<br>Variable resistance, new . 240<br>Vibrating wires, effects to . 240                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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                                                                                                       | AUTOMOBILES ACCRESORIS AND SCHOKES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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| tion trimper by f d pressure \$812   Illadio belophenty range finding \$500 exactli film belong \$500   Topical plane film belong \$500   Topical plane for easily per the film belong \$500   Topical plane for easily per \$500   Topical plane for easily | AUTOMORILES APP STADENS APIL Pressing registers Apil Pressing registers Been and lamp combined Jack indoor Labricating the one Clay register one Redistors care of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                                                                                                                                                                                                                                                                                                                             | Executives station 7657 Grant oer maters 215 Subwaye pros be adjusted 25 Trofley wheels, begger , 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| Torpedoplane of reality 95<br>Towing barge for navel pi nee 900                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| 7oj el ne na naval secular 625                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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#### Latest Patent Decisions (Continued from page 701)

measuring and weighing devices of the state and in use in the state

e Standard Company manufactures combination spring and lever computing scale which was then being used and sold in New York It is equipped with a compensating device which is not auto matic Because of these specifications some county and city scalers of weights neglected to seal scales of plaintiff s make and warned scale users to discontinue the and warned scale users to discontinue the use thereof. A state inspector who was a subordinate of the state superintendent also marked some of these scales, slow and faulty. As a result the Standard Com s business in New York was injured sales diminished and collections for scales theretofore sold became difficult. The Standard Company contends that its scales with a mechanical compensating device are at least as trustworthy as those of its competitor with the automatic device and it presented these views to State Superintendent Farrell both before the sponifications were issued and there

Held that so called specifications to automatic computing scales are not a regulation of law within the prohibition of the Lederal Constitution as to state on one rearral Constitution as to state legislation their function being oducational and at most advisory. Stantist Computing Scale (c. v. Farrell. Supreme Court of United States.

The plaintiff in this bill in equity charged infringement of re-useue latters patent for an improvement in box strapping invented by Leon S Howe The bill further charged unfair competition. The District Judge sustained the patent held that there was infringement and dismissed the charge of unfair competition. The defendant denied that there was invention or infringement but says that the patent | They may occur singly or two may be in suit is invalid because it claims not a heard in rapid succession and more fre patentable combination but a mere ag gregation of old clements. It further claims that the reassue patent is invalid

claims that the re-issue patent is invalid the Yandott hills known as the Stony.

Box strapping used by maintier uners, the strapping used by maintier uners, the strapping used by maintier uners, the strapping used by maintier under the united strap words and the strapping used by maintier under the united strap words and the strapping used to have been sufficient to the strapping are nailed around cach and the strapping used to have been sufficient to the strapping used to hav partially the case as a fast interior the intended goodpeen important the parallal shape to be parallal shaped the parallal shaped dawn a branch of the pushed and hauled over and all soft the case as a fast that flowed dawn a branch of the case and hauled over and all soft the case and all shaped the case and all shaped the case and t pushed and fished over and at yet the cream culty freek and remnants of the floors of warehouses ratinoid care or on flow exists as actions of low hills. These the decks of ships it is essential that the terminal control of the strapping and the mails the remnant of the transping and the mails the strapping and the mails that the control of the strapping and protected as to avoid their catching the though and protected as to avoid their catching the three described by the residents of the intention and thus prevent the strapping the strapping and the strapping the strapping and the in the floor and thus prevent the strapping

#### Germany's Aircraft Experimental Station

A MONG the places visited by the Allied Naval Commission in German waters was Warramonaton in terman water was Warramonde the great experi mental station on the south coast of the probable that they are The bearings the Commission visited the station there a part of the parab through which there were close on 200 machines in the dosen or more sheds practically all of them of new types or old ones in process of im ent The latter included some very useful looking Brandenburgs, Albatrosses Frederichshafens and Gothas, most of which seemed to indicate an effort toward lightness and speed rather than an increase of size Light but very strong steel pontoons were the rule among all of these pontons were the rule among at of these new machines Generally speaking they were less highly finished than similar British and French types but there was no indication whatever that they had suffered istratas and i reach types but there was no i Smeaton filli or Mount Acoroccheang, an undecation whetever that they had suffered extinct volcano where faults are known through shortage of any materials. Alu-About ten miles south of the piaco where minum—or where greates strength was the supposed broudid semante, three an object the alloy, duralumm—were extant volcanoes, Eastern Hill Mount used lavably, and even bras and nickel Prospect and Langdon still includes a line were not stumped. The camouffaging of fracture of the earth scruh. If this line had been very chassity and effectively done be proposed northward, it would pass by printing a design—usualty a heangonal close to where the sounds originate.

pattern in which deep marcons and indigos predominated—directly upon the fabrics before applying the dope
A powerful two-engined Gotha torped >-

dropping scaplane attracted a good deal of interest less on its own account than because it was experted that the Germani would have a voly much hat derive that it development of the type. Of very land types continues Arronaulus there were several as he of Iravenumdes 8 V K S. and Sablatings in in if them large but all in their trum lines and powerful engines showing the cenation office to development where the continues of the co would have given much attention to th ever was a giant scaplane with four engines and with a wing spread of some thing like 150 feet I hough this was greater than that of the great monoplane at Nordeny it is not improbable that the latter had a greater wing area and perhaps a greater lifting power. No better idea of the size of the fuselage of this scaplant could be given than by mentioning that in the courts of inspection four of the Allied facers and 12 of the Germans were standing on the floor the writer could eatch no glimpse of one of them

#### Subterranean Noises in Australia

Solution resembling expications which could not be traced to any mining or quarrying operation are heard at intervals in the Daylesford district of Victoria says the Australian Geological Survey The sounds are described as resembling thunder or the explosions made in blasting rocks quently in wet than in fine weather. The noises are said to come from a portion of the Yandoit hills known as the Stony

other countries and are generally known as bronted (like thunder) in India they are known as barisal (guns), in Mexico as bramidos (bellowings) in Italy as marine

es shore)
It is not certain that the Yandort noise apparently passes a line of weakness the surface indications of which are a series of surface indications of which are a series of mineral springs and on the southern extension of this line is a line of fissure cruption. It is possible that the noises originate along a fault line that move ments are yet taking place, and that the

There is another possible explanation in that the locality where the sounds are heard is volcanic since the part indicated by the bearings is within five miles of Smeaton Hill or Mount hooroochesng, an





Hero Safety Razor 35c B me type as the t at known \$1 safetics W ad ful value Se t milts with one blade for \$2e blade for Sic HFRO BI ADES— high quality steal keen edges that keen edges that ahave and last Als fit Star Gem kver Roady Write for sample package 8 for 18e

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                                                                                                                                             | Pavement, tearing up old 8706<br>Road vs load 8<br>Bu won highways 113<br>Su w roller hardr ads with 937<br>ROPE MANILA BRITTLE, 281                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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La np scotylene 17c                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                                                                            | SAW that is different \$126<br>SAW, TOOTHIESS 231<br>SCAPPOLISS 567                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| I LI MINATI N See also ELECTRATED A CONTROL OF A CONTROL  | MACAPTIC PAIL IN  MACAPTIC PAIL  MACAPTIC PAI | OAK KIIN DRYING MA<br>CFAN CIRRENTS 5.7<br>RDNANCE AND ARM # also                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ARPTY Des has rease annual reason and a reas | Cansesdage principles of **6, 116 Cavalry net out of date French Aresands Londbratta, phemphonessent of 71 Listening for the savery Alies Aresands Folson gas Polson gas Polson gas Polson gas Donated Wartane Service 214 US Chassical Wartane Service Wind corrects discussion and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Alsace I rraise loss of the Argan is a likes our office furniture ture Bolsheviki exporting the 402                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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                                                                                                                                             | War s once in the SCIENTIFIC AMERICAN Book catalog c new 108 Papers I the sidders 22) SCULFTURE DRIED-AIPLE 255 NFA, VOICE OF THE 770                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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                                                                                                                                             | SCULPTINE DRIED-AIPLE *285<br>SFA, VOICE OF THE *70<br>SEARCHI IGHT MIRRORS *691<br>SECOND MIGHT *884                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| Frenci sold er miaptable *12 Furniture fore gn trade n 434 Furniture f r tropics 515                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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| Reconstruct on American a<br>chinory 48<br>Reconstruct! n and industrial en                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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                                                                                                                                             | HUBMARINES See WARRIES and<br>WAR THE STROPEAN<br>SIRWAYS NEW YORK 22 *867<br>SIN See APPS NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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                                               | Puravane a steel els k *31<br>1 ts ew Srtsl *368<br>Renaur nu wooden sh w i s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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*071 Flora f tho I h hpp n 10 Leaves ten persture 3 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | WIRELESS TRIBUTATES TELL PHONES See M. 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| Wridi or making 92<br>World narksts 1 Anion an<br>nanifactures *12 *78 *124<br>174 *258 *221 *4 *14 * 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Clo de f ra ed by a rpla es 1 F g s gas actiue y 21 O can fiv ag wist weather nan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | PUBLIC HIFAKING n enl *480<br>I I NCHFS, HAND, rew lea *634<br>I YROMFTFR SIMPLE 1 FF1<br>CIFN1 *16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | TRADE MARKS See INVESTIGATION AND PATTHER TRAITS FAMILY JOS TRI IS AND FORESTRY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | WIRELEON TRANSCRAPHY Asrial new selective 257 Aerials trees as 327                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| Worl narkets   Ancr an manufactures   12 eVs   1 | T pd of y't t a budler ac 621 T all ng f y re f y r | CIFN1 *16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | THAPP MARKS BE DIVERSITION AND THAT AND THAP THAP BE AND THAP THAP THAP THAP THAP THAP THAP THAP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | wTHELESSA TELEGISAPSY Asrial now ashesive 1877 Asrial trees as 1877 Asrial trees as 1877 Asrial trees as 1877 Asrial trees as 1877 Assistant the wireless of 1877 Amsters wireless revival of the 1877 British adversors reads Capability of the 1877 Asrial trees as |
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North See, "204" "91  MINI I RAHIMA P. North See, "204" "91  MINI SEE, MINI SEE, WILLIAM P. SEE  CONTROL OF THE SEE | BADIO ACTIVOTA DICT.  RAII ROADS fee she sacre recommended for the sac | Pigeons for fire protection 450 TUBE HOLDER collapsible 634 TUNGRTEN and steel industry 158 TUNNELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | British radio schemes 58 Easy method of mastering 681 Equipment of George Washing-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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                                               | Gold dredg glv prado af #31<br>Gold, ilea of #404<br>Orr lep s al a g Ul                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | RAII BOADS See also n MTM Car dun per, biggest Car la ador that weig a load Car movement—word a corl Clamps for derailed on n "1" Flooridae iou Italy Forty England France 21  21  22  23  24  25  26  26  27  28  28  28  28  28  28  28  28  28                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Canal Street tunnel 437 Channel tunnel decide to build 4398 Connecting States Island with Manhattan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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| *34 *N) *] { *[_0 *]7] * N<br>*214 *204 *322 *34 *377 * N<br>*4 9 *102 *5 2 *584 * 1<br>*[nyeq] *n no noty tate *[] *3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Spitaborgen m ralm * 1.7<br>Seudles as dank ng * 1.7<br>Sie ton ope f e *581<br>The Bow to ag *331                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Forry England Franco #21 Freight ears of conc ato #143 Freight as a when, bu p #573 Rad ends represent 145                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Deep-drainage tunnel #831<br>Fagiand to France by rail 810<br>Faginal Channel #399<br>Gibbsh Channel #399                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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| *1 2 *17% *219 **98 **324 **148<br>*38 *41 *44 *47 *404 */ *4<br>*586 *) 14 * 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | To How the second of the secon | Hair der biem, ac ut on nf 112<br>Hail sawing machine p risk is *448<br>Sha kless raikroad er se ag *16<br>Siespers improved *31                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Relative efficiency bridge and<br>tnamed 247 346                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Transmitter improved 23 Trees for ears with 554                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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| Patent decisi na recent 12 22<br>860, 594 18<br>Patent Office an naless t 42                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MONJULICIE » lota 17 N TORBOALS See also warm CPR Pr pulle Louring 4465 MOTORCYCLE tripe tax al 463                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Standing train safety Nat way core abipp d a ow whoels Terminal problem N w Y rk 20 To anne abiperde f 3 k                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | TURBINE STEAM, 190,000 h p *650<br>FURPENTINE in Germany 331                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Transmitter improved 27 Transmitter improved 28 Trees for eary with 28 Underground wireless 29 Wireless and morals Wireless control is new dress 18 Wireless station, France 29 WIRE ROLLS, HRONING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| **M60 **)44 ** 11 Invention n to of r Pasent decid as revent 12 22 **M60.5 ** 12 **M60.5 ** 12 **M60.5 ** 12 **Pasent olef fiell f **Patents and profit - 72 **Patents force n u 1 4 **Solential patents u 14 **Solential patents u 16 **Tradernark openirations niceromathy and that                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TORHUATA Nec also wars (Fig. 7) Pripile louring 4465 MOTORCY(1E; risel tax al 4514 MOTOR (1C) E in the fur r 4993 MOUNTAINFRING C/UIN MOUNTAINFRING C/UIN SE! MOUNTAINFRING MOVING 316                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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| Trademark New as national 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Camera for rapid moving obje ts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | RANGE FINDING, submarioe 07 RECONSTRUCTION Nee also HDUS THE AND TRADE ASSESSMENT MARKET MANY TRADES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | VITAL STATISTICS United States 93                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| IRON Acid resisting from 336 Changes in from 29 Electric rest from 38 Iron that can be whittled 18 IRRIGATION SCHEME Ingeu ous 47                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ryes motion pictures and 575 Garn an glass film 494 industrial films Denmark 291 Picture a long under one r of 7057 Reiticass laberatory 9543 War photographing the 7648                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | England . 994 141 *105 *198 *278 *259 *259 *256 *275 Europe reconstrution in 364 Prance *207 \$455 \$455 \$455 \$455 \$455 \$455 \$455 \$45                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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                                               | Suitcase inheratory *043 War photographing the *044 MUSIC Periscope for musical threator *136                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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| KEON device for moving *176<br>KITES AIMPLANE *661                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Periscope for musical director *126<br>Pipe organs hambee 235                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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Clark Internal Gear Axle is to a motor truck what a full floating axle is to a passenger car.

> Clark Disc Steel Wheels for motor trucks not only look stronger but are stronger.

> > Clark Equipment is found only on good motor trucks

# CLARK EQUIPMENT COMPANY BUCHANAN MICHIGAN

